Enhancing Agriculture in Africa: A Role for U.S. Development Assistance

Volume II--Contract Papers

Part C-2: Development Assistance and Low-Resource Agriculture (Continued)

8. Links Between Private Enterprise and Low-Resource Agriculture in Sub-Saharan Africa
(Arthur Gibb, Jr.)

9. Strategies for Development of the Private Sector and Its Links with Low-Resource Agriculture
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11. Farming Systems Research and Extension: Status and Potential in Low-Resource Agriculture
(Susan Poats, Daniel Galt, Chris Andrew, Lisette Walecka, Peter Hildebrand and Kenneth McDermott)

December 1987

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FINAL DRAFT

LOW-RESOURCE AGRICULTURE IN AFRICA

LINKS BETWEEN PRIVATE ENTERPRISE AND LOW-RESOURCE AGRICULTURE IN SUB-SAHARAN AFRICA

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FINAL DRAFT

Revision #1 (July 86 draft - citations incomplete)

LINKS BETWEEN PRIVATE ENTERPRISE AND LOW-RESOURCE AGRICULTURE IN SUB-SAHARAN AFRICA

by Arthur Gibb, Jr.*

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I. INTRODUCTION

A Challenge for the United States

1 Seeking to promote smallholder agricultural advance is almost certainly the right strategic priority for many Sub-Saharan nations today, for efficiency as well as equity reasons. The question this report addresses--essentially, what role can the private sector play in fostering smallholder advance--is notable for of the comprehensiveness of its purview. It necessarily involves not only private enterprise links to agriculture at the local, regional, and national levels but also the collateral issues of the policy environment, of how to disseminate improved agricultural techniques, and of rural urbanization.

2 This report is ultimately concerned with the question of how the United States government can most effectively aid the process of economic development in Africa. Four years ago a professional acquaintance recently returned from a trip from Africa said with visible concern, "It was only this last trip that two things really struck me full force. The first is the fact that in many African countries virtually the entire investment budget derives from foreign aid, so it is terribly important that we be doing the right things. The second is that by and large, we aren't--much too much of what we are doing is peripheral."

3 Clearly, much has changed in the last few years as the efforts at policy dialogue and reform have begun to bear fruit. Nevertheless, the underlying challenge for United States aid

efforts in Africa today remains to find ways to assure that development efforts there are focused on central issues, not peripheral ones, and on the cores of these economies, not their fringes.

4 The immediate question to be addressed in this report is whether there are significant links between private enterprise and smallholder agriculture in Africa and whether the roles such links play can be enhanced so as to promote rural growth and welfare, especially through American actions _via_ its foreign aid program and its leadership in international organizations. To anticipate the conclusion, the answer to both these questions is strongly in the affirmative, with the _caveat_ that effective American efforts in this regard will _require_ sophistication and a careful understanding of both private enterprise and rural growth in developing nations. There is a tendency from an American perspective to identify private enterprise abroad too much with the multinational corporation. It will be seen that multinationals in general account for only a small, though sometimes crucial, part of the system of private sector linkages to smallholder agriculture.

The Geographical Dimensions of the Issue

5 The topic of this report at first glance would appear to be impossibly broad. Which low-resource agriculturalists (LRAs)-- the pastoralist? the isolated subsistance farmer on poor land? or simply the smallholder who lacks market access due to lack of feeder roads and market points? What private enterprise--multi-

nationals, like the oil companies and agri-businesses? the indigenous input supplying and output marketing enterprises? or the varied set of local, small-scale enterprises with which the farmer has his day-to-day contacts?

6 The topic can in fact be addressed in a general way, but to do so requires that the discussion have explicit spatial dimensions. These dimensions are characteristically ignored in economic analysis and yet are of the essence when dealing with rural growth since agriculture is a spatially-extensive production system.

7 The geographical context relevant to smallholder agriculture is a hierarchy of trade areas--the world market, the primate city (and secondary cities as well if it is a large nation), and then the agricultural region of perhaps one million(±50 %) people. (In much of Africa the province corresponds to this agricultural region.) Within these regions occurs the "tertiary urbanization" of the nation, characteristically in each region a region center, several sub-region centers, and the local trade centers.

8 For present purposes it will be convenient to assume that in Africa today the region centers and sub-region centers enjoy the status of towns and are linked by all-season roads but that the local trade centers are still only "central villages" and lack both all-season road connections to their sub-region center and adequate feeder roads or traces to their villages. The central villages are identifiable by the fact they harbor the principal weekly periodic market of the locality and certain educational and administrative facilities.

The local trade center is the key point in this spatial system.

system. The Mosher (1969) rule of thumb is that portering costs are such that a farmer must be within one mile of a road and three miles of a trade center if it is to be economic for him to market a produce surplus. Beyond these distances he will engage in only subsistence agriculture, taking any additional labor to market on foot, or in the form of some more transportable product. A key point here is the fact that it is the outputs of a higher-productivity agriculture that are costly to transport, not the inputs.

10 Given this geographic context, it is possible to make the distincions among LRAs and private enterprise upon which the present analysis will depend. Among LRAs, it distinguishes pastoralists,smallholders in sparsely-populated and resource-poor regions, and those smallholders in relatively densely-populated regions who do not presently have adequate access to the services of a local trade center. Among private enterprises, it distinguishes between those at the "local level", those at the regional and national levels, multinationals operating within the country, and finally private voluntary organizations (PVOs) operating at the local level. There is also a crucial distinction between whether, in a given context, a private enterprise is functioning as a source of agricultural growth or as a consequence of such growth.

11 A basic concern of the report is who does, and who does not, have access to the services based in the local trade center. This is the point at which the farmer connects with private enterprise--at which he gains access to the information about

improved agricultural techniques which is disseminated down the urban hierarchy, to which he brings his surplus to be marketed up the urban hierarchy, and at which he gains access to the goods and services produced by local, regional, and national enterprises. Ultimately, the access issue is the bed-rock equity issue for agricultural policy, determining as it does who is, and who is not, included in the exchange economy.

Summary of Report Recommendations

12 It may be helpful to summarize the broader recommendations of this report since they suggest the scope of the question and simultaneously identify some of the key issues. The recommendations suggest both things to do and things not to do.

13 On the positive side, there are three recommendations: (i) that smallholder development be recognized as dependent on a system of public and private activities and that national efforts to promote rural growth should consciously provide for the participation of all major elements of this system; (ii) that development efforts anticipate and prepare to support a rapid expansion of trade centers and African entrepreneurship at the local level in the next decade as a consequence of smallholder advance, and (iii) that it be recognized that the marketing and distribution sector is of special importance to smallholder advance and has a ~~major and~~ multifaceted role to play in it. In general these recommendations are a prescription for the government first and foremost to play a leadership role in mobilizing the energies of all those involved in broadly-based agricultural

advance. Direct government interventions would be limited to promoting the widespread adoption and use of strategic "change agents".

14 On the negative side, United States development strategy towards Africa should be formulated in such a way as to discourage the use of scarce resources in certain often-popular areas until higher priority needs have been fully met. Specifically, development, as opposed to relief, activities should avoid unwarrantedly high priority being given to the following:

(i) poverty alleviation among smallholders in fringe areas: scarce resources should be concentrated on"high return" areas, which are often the more densely-populated, higher-income regions;

(ii) manufacturing activities as leading industries: "manufacturing," in general, is not directly relevant to smallholder development (though it will benefit from it) and large-scale agro-processing industries in particular cannot be counted on to be a key factor in smallholder advance;

(iii) fundamental changes in the structure of the non-agricultural economy until after its functioning has been improved by measures to assure competition and entry in most sectors: " cooperation" should not be viewed as an alternative to private enterprise in the short-run, though it should be fostered (to the extent resources permit) in conjunction with efforts to decentralize responsibilities to the local level;

(iv) certain programs that seem attractive but tend to be too demanding in terms of resources, including: subsidized credit, programs based mainly on rural co-operatives, direct promotion of small-scale enterprise, rural financial system development beyond de-regulation and encouragement of private banking, and home mortgage finance development.

The Organization of the Report

15 The organization of this report relies on several simplifications and distinctions. First, the report in the main takes "low-resource agriculturalists" to be simply "smallholders", their special characteristics in sparsely-populated areas being discussed in the Annex. Second, in the initial discussion it is convenient to identify private enterprise with "rural growth linkages", even though the latter include some public services at the local level. Specific distinctions are made as necessary.

16 A third distinction is the focus on densely-populated areas. Sufficient evidence exists to suggest that there is a general model of farm/non-farm linkages in such areas and that it is applicable to Africa. Simply stated, at given levels of income and of infrastructure development in a region characterized by smallholder agriculture, similar patterns of local enterprises and of linkages to regional and national enterprises tend to occur. Thus, the bulk of the discussion that follows will be concerned with areas characterizable as "reasonably densely populated." Sparsely-populated regions are more difficult to

generalize about for a variety of reasons. They can be discussed most effectively as an extension of the general model for densely-populated areas. This is done in the Annex, covering both sparsely-populated settled areas and pastoralists.

17 In the next section the nature of rural growth linkages is described, using mainly Asian data and a "structural transformation model of rural development." The general literature and evidence on rural growth linkages is reviewed in Section III. The evidence from Africa is discussed in Section IV in the light of this general model. Section V provides a discussion of the specific roles private enterprise plays in rural development at the local, regional, and national levels and and the policy possibilities that follow from this assessment. The topics of multinational enterprises, private voluntary organizations, seasonality, and the role of women are also covered in this section. Section VI discusses what elements are central and what peripheral in progams to promote smallholder agricultural advance and also briefly discusses the comparative advantages of the various donors and other foreign actors. Conclusions and recommendations are presented in Section VI.

II. THE NATURE OF RURAL GROWTH LINKAGES

Definition and Measurement Problems

18 Rural growth linkages are the backward and forward economic linkages that emanate from the agricultural household. Some of these links are sources of agricultural growth but most of them are consequences of this growth.

19 As a producing unit the agricultural household has links backwards to agricultural input suppliers and forwards to output processors and marketers. This household is also a consuming unit, however, so rural growth linkages prominently include forward consumption linkages. Indeed, consumption linkages are of dominant importance in characterizing rural regional growth for many purposes.

20 Simply stated,rural growth linkages are the non-agricultural activities found in an essentially agricultural region plus the production and consumption linkages that extend from the region to the rest of the national economy. The tendency is to attempt to measure these links in terms of non-agricultural output or in terms of expenditure on that output. However, two other measures are often useful--employment in non-agricultural activities and the size and distribution of urban activities of the region, the latter being defined as those occuring in trade centers.

The Structural Transformation Model of Rural Development

21 A simple, though multi-faceted, model suffices to characterize the basic relations which rural growth linkages reflect. Most research in this area is consistent with the model but typically focuses on only one of its dimensions.

22 The concept of structural transformation is most closely associated with the work of Kuznets (1966). It is commonly employed to characterize the process of economic development as the transformation of an economy over time from being essentially rural and agricultural to being more urban and industrial, measuring these changes in terms of output, employment, and urbanization (cf., World Bank, 1979). Originally conceived as applying to national growth and development, we apply the concept here to rural development by employing it as an export-base model of regional growth.

23 The summary statement of the structural transformation model of rural development is as follows:

> In a region whose base industry is entirely agricultural, as agricultural income increases (as a result of an increase in agricultural productivity, _ceteris paribus_), demand runs increasingly toward non-agricultural goods and services due to Engel's Law. As producers respond, the structure of output becomes increasingly non-agricultural, the structure of the labor force becomes increasingly non-agricultural, and urbanization increases. (Gibb, 1984)

The underlying assumptions of the model are (i) that the region--the "functional economic area"--is defined by the extent of the farm-to-market road system (which defines the area within which specialization and exchange occurs) and (ii) that full-time non-agricultural production occurs in trade centers.

23 In sum, the model specifies the sources of growth--an increase in agricultural productivity--and the consequences of growth--structural change in output, employment, and urbanization. The latter are the three dimensions along which structural transformation is typically measured. They can also serve as measures of the magnitude, composition, and trend of rural growth linkages.

24 Spatially, the model hypothesizes a "standard agricultural region" of one million(±50%) population which is served by a three-tier hierarchy of trade centers--one regional center, 3-5 sub-region centers, and 15-25 local trade centers. At low income levels the lowest tier of trade centers may be composed only of "central villages" which host periodic markets. Even the sub-region centers may not be classified as "towns" or "urban", although most of them tend to be. The regional center typically is the regional administrative center and is classified as "urban".

25 The linkages deriving from the functional relations of the model are straightforward. Agriculture is the "base industry" of the region; non-agricultural activities are the "dependent industries". Dependent industries are composed essentially of

agro-service activities, consumer activities, and public services. Presuming agricultural growth, as agricultural output rises agro-service activities expand as a function of backwards and forwards production linkages. Assuming prices constant, agricultural incomes rise proportionately and consumer activities expand as a function of the expenditures by farm households. Public services tend to expand as both direct and indirect functions of rising farm output and incomes, as well as being due to exogenous forces.

26 Spatial development is introduced into the model by the assumption that full-time non-agricultural activity emerges at a given tier in the region's urban hierarchy once that trade center's market area has become large enough to support ~~a~~ full-time enterprise~~s~~. This assumption reflects two underlying dynamics. The first is the move of village-based, part-time non-agricultural activities into a trade center when they become full-time, a pattern mainly associated with consumer activities. The second is the move progressively downward through the urban hierarchy of more specialized activities as minimum market sizes are achieved by lower-order trade areas. This pattern is especially associated with distribution and marketing activities, characteristically involving not only the marketing of agricultural produce but also the distribution of agricultural inputs, consumer goods, construction materials, and vehicles, equipment, and spare parts.

27 The external linkages of this standard agricultural region are distinctive in that they tend to run directly from the region

to national urban centers, often transiting other standard regions without significant contact with them. Thus, in general the model assumes no inter-regional linkages. It should also be noted that in general manufacturing, beyond artisanal trades and crafts, is not a factor in rural structural transformation.

28 The level of agricultural income and the cost of farm-to-market transportation are the prime determinants of the level of structural transformation in this model. The level of structural transformation is best measured in terms either of the percentage of full-time non-agricultural employment or the percentage of "urbanized" population in the region. The number and location of urban functions in the region provides another measure of the urbanization dimension. The process of structural change is best evaluated by either employment or expenditure elasticities as a function of changes in agricultural output or income.

Caveats to the Model

Sources of Growth and the Question of Production Linkages

29 It is crucial to distinguish between the sources and the consequences of growth. The structural transformation model basically takes the growth of agricultural output as a given and focuses on its consequences, that is, the rural growth linkages reflected in the non-agricultural activities serving agriculture.

30 The production linkages--the agro-service industries--are defined in the model as consequences of growth, that is, of the

farmer having adopted an improved technique which has raised yields (output per unit of land) and hence output. (Weather is assumed away.) The backward production linkages include activities supplying inputs--seeds, agricultural chemicals, credit, and tools and equipment. The forward linkages encompass the activities associated with marketing the output--collection, storage, processing, transporting, and the actual marketing.

31 Seen in dynamic terms, a broader definition of production linkages is possible which incorporates the sources of growth. This definition would include the national agricultural research effort, local adaptation trials and demonstrations, all local efforts to disseminate information on a new technique and encourage its adoption, national policies affecting the prices of inputs and outputs, and finally the question of how to assure the availability of input supply and output marketing channels.

32 Because agricultural research and extension are characteristically public sector functions in developing nations, they will in general be treated as beyond the scope of this report. By the same token the question of which techniques should be researched and disseminated falls outside the scope of the question as to what role private enterprise can play in fostering agricultural growth. However, it does matter whether the techniques involved require commercially-provided inputs or not.

33 If the technique disseminated requires commercial inputs and credit, private enterprise can play a crucial role in the information dissemination. If commercially-purchased inputs are not required, the role for private enterprise in disseminating

information about it is much diminished, but still not negligible.

34 There are fewer qualifications as regards the forward production linkages. Once an improved technique of whatever type has caused an increased in the marketable surplus, private enterprise will tend to provide the services which comprise the forward production linkages, if existing transport costs permit this to be done profitably. Governments in Africa have often attempted to arrogate this function to the public sector, usually unsuccessfully.

The Part-Time/Full-Time Dychotomy and Enterprise Development at the Local Level

35 The structural transformation model of rural development fits the present discussion notably well to the extent that it tends to focus attention on the growth of both private enterprises and of trade centers. It does so, however, at the expense of overlooking the role of part-time, village-based non-agricultural activities.

36 Although the model as stated is general and allows for expansion of village-based, part-time non-agricultural activities, its principal application in this paper is in modeling the growth of the full-time, trade center-based activities. The crucial distinction here is between non-agricultural "activities" which is general and includes part-time endeavors, and non-agricultural "enterprises," which is limited to full-time activities, whether fixed or itinerant.

37 At the basic level of the self-sufficient village--an agricultural settlement with no trade functions--needs for non-agricultural goods and services are characteristically met through the part-time activities of farm households. As agricultural incomes rise and demands for non-agricultural goods and services increase, these activities tend either to expand into full-time activities or to be supplanted by commercially-provided goods and services. The shift from a part-time to a full-time basis tends to be accompanied by a move from the village to the nearest trade center. The result of these tendencies is a trend toward specialization in terms of location, non-agricultural activities becoming concentrated in trade centers and agricultural settlements becoming increasingly specialized in agricultural production.

38 There are two particular implications of the part-time/full-time dychotomy so far as African smallholder development today is concerned. The first is that care must be exercised when using employment statistics for rural areas as a measure of structural transformation, since enumerating all those engaged *at any time* in non-agricultural activities tends to greatly overstate the relative magnitude of non-agricultural enterprise. Full-time employment often provides a more stable and useful measure of both non-agricultural enterprise and trade center activity. The second is that in sparsely-populated areas, part-time activities will persist longer, and enterprise development will proceed more slowly, than in densely-populated areas. Trade areas that are attenuated by sparsity of population or by

low incomes are unable to support the early development of trade center-based, full-time enterprises. To some extent itinerant, full-time enterprises substitute for the latter, however.

39a It should be noted that non-agricultural enterprise as a term encompasses public as well as private activities and applies equally to agro-service, consumer, and public service activities. Thus, at the local level the school, the health unit, and the agricultural extension service office are "enterprises", albeit public ones, as much as are the other full-time activities.

39b Indigenous private or voluntary community service organizations often operate at the local trade center level and can be key ingredients in fostering the adoption of improved agricultural techniques. They can reasonably be characterized as local enterprises, though most are not commercial in nature. They can include private schools, religious and social organizations, and development committees. In the discussion that follows there will be occasion to include such local private voluntary organizations among the private enterprises relevant to smallholder advance, especially with regard to local trade center development and to the roles of international PVOs.

The Local Trade Center Function

40 Our model presumes a "locality" centered on a "local trade center" and that this is the level at which agricultural growth must be fostered. In a region which is spatially well-articulated, the hierarchy of central places will be essentially pyramidal. Thus, most farm households will be served by the

evenly-dispersed, bottom-tier, local trade centers, although in the case of those in proximity to the sub-region centers the latter will serve as their local trade center.

41 In a spatially underdeveloped region where only the region and sub-region centers are adequately integrated by roads, an island-like pattern of commercialized agriculture results, with the sub-region centers providing both local trade center services and sub-region center services to their immediate hinterlands. Ribbons of commercialized agriculture will also occur along the connecting roads because of the access the roads provide to the local trade center services available in the sub-region centers. For present purposes it will be convenient to think in terms of such an island-cum-ribbons pattern as encompassing perhaps 50 percent of a nation's rural population while some 40 percent reside in the poorly-served trade areas of the local trade centers located outside this pattern. The remaining 10 percent are assumed to reside in isolated or sparsely-populated areas difficult to integrate into the national economy.

III. THE GENERAL LITERATURE AND EVIDENCE

42 A wide-spread perception that not much goes on in the countryside of a developing nation is rooted in economic literature as well as in urban bias. It derives importantly from Hirschman's path-breaking analysis of linkages in economic development (1959). In arguing the case for unbalanced growth, which was focused on the industrialization process,he asserted--correctly--that backward and forward linkages from agricultural *production* are weak as compared with those from industrial production. He essentially ignored the potential of consumption linkages from agricultural growth, however.

43 Three decades later the record is in across a wide diversity of countries--Hirschman was simply very wrong in asserting that linkages from agricultural growth are weak. The record shows that in an essentially agricultural nation--except for in a few spectacularly special cases like Taiwan and Korea--it has been the linkages from agricultural growth that have characterized the development process as it has affected the bulk of the nation's people. The consumption linkages turn out to have provided broadly-based employment opportunities, to have underpinned "tertiary urbanization," and to have provided customers for the nation's industries. Thus, because of consumption linkages, when a nation has set its agricultural strategy, it has is also set the largest part of its employment and urbanization strategies. When its agricultural strategy has throttled smallholder agriculture's income growth, it has throttled the structural transforma-

tion of its rural regions, as the mega-cities and improverished countrysides of more than one nation silently attest.

44 A parellel perception that agricultural linkages are restricted to areas classified as "rural" and that areas classified as "urban" (towns and cities) are somehow inherently the creatures of industrial growth has persisted long beyond the availability of evidence to the contrary. The evidence is unambiguous that in the typical developing nations most urbanization is agriculture-based, that is, is accounted for by the cities, towns, and local trade centers of agricultural regions.

45 For various reasons there has been a reluctance to acknowledge the scope and importance of rural growth linkages and the rural structural transformation process. To an important degree this has been due to the simple lack of statistical measures and evidence ~~of~~ for rural growth linkages. It seems likely the concept of rural structural transformation will finally come into its own in connection with African development, given that it is so relevant to that process and that the body of evidence ~~on~~ about it has become significant.

The General Literature on Rural Growth Linkages

46 Rural growth linkages as a concept can be said to have been defined initially in the works first of E.A.J.Johnson and then of Mellor and of Johnston and Kilby. E.A.J.Johnson (The Organization of Space in Developing Countries, 1970) drew attention to the fact that modern agriculture was dependent

upon specialization and exchange and hence required well-articulated patterns of trade centers. Mosher had provided a complementary view in A Progressive Rural Structure for a Modernizing Agriculture (1969). In this he argued that the farm household as a producing unit requires access to a three-tiered hierarchy of market centers to support its production linkages.

47 E.A.J.Johnson was closely followed by Johnston and Kilby (Agriculture and Structural Transformation, 1975) emphasizing the substantial linkages between agriculture and non-agricultural activities in general, especially the production linkages to the industrial sector. Johnson and Kilby also distinguished bi-modal (estate *cum* smallholder agriculture) and uni-modal (entirely smallholder agriculture) regimes, emphasizing that a uni-modal regime tends to encourage rural enterprise and employment growth as a result of a larger proportion of agricultural income being spent on locally-produced goods and services. Mellor (The New Economics of Growth, 1976) extended the discussion to argue the possibilities of agriculture-based growth as a strategy, in the process defining the concept of rural growth linkages comprehensively so that local consumption linkages were finally given their full weight, at least conceptually. A representative list of the activities which rural growth linkages spawn at the local and sub-region levels at intermediate income levels is provided in the Appendix (from Gibb, 1974).

48 More recently a literature has developed concerned with identifying the scope and functions of urbanization within agricultural regions. A literature on "urban functions in rural

development" (Rondinelli, 1984) has produced a number of inventories of the composition of non-agricultural activities in rural areas by their frequency of occurence and by where they occur in the hierarchy of urban places. The three-tiered hierarchy of market centers characteristic of agricultural regions were identified as "tertiary urbanization" by Gibb (1984),to be distinguished from the primary and secondary urbanization of the primate city and secondary cities, respectively. Employment statistics were shown to be able to measure not only the magnitude and growth rates of such urban centers but the underlying functional relations as well. Wanmali (1985, 1986) has evaluated rural growth linkages in terms of the "rural services" available in market towns. Hamer (1986) has emphasized the critical role tertiary urbanization plays in Africa in harboring both the rural growth linkages and the channels by which new agricultural technologies are transmitted from the national level down to the local level.

49 The measurement of rural growth linkages had to await methodological innovations since it was not possible to distinguish agriculture-based non-agricultural activities within published statistics, since these activities occured in both rural and urban areas as these areas were typically defined. The first attempt to disaggregate non-agricultural activities as between agricultural and "non-agricultural" regions was undertaken by Gibb (1971) using 1968 labor force data for the Philippines. Conservative estimating suggested that in 1968 nearly three-quarters of the Philippines' non-agricultural employment was

located in agricultural regions and could reasonably be assumed to be directly or indirectly agriculture-based. (See Table 1.) The full range of non-agricultural activities (by the ten major industry groups) was represented at all three tiers of rural market centers. To the extent that the major industry group classifications reflected rural functions, the employment data was able to suggest both the magnitudes and functions of rural growth linkages at each level of the urban hierarchy within the Philippines' agricultural regions. Anderson and Leiserson (1978) found corroborating evidence in their analysis of published labor force data for developing nations, concluding that the non-farm employment of agricultural regions appeared typically to be of dominant importance within non-agricultural employment nationally.

Attempts to Evaluate Rural Growth Linkages

50 Subsequent analyses of rural growth linkages have been undertaken essentially at the regional level. These analyses have tended to focus on only one of the three dimensions--output, employment, or urbanization--of rural structural change. However, the employment-focused studies have often produced useful measures of urbanization as well as employment, to the extent that their employment data indicate the geographic distribution of population and reflect the several types of farm/non-farm links.

TABLE /[illegible]

LOCATION OF NONAGRICULTURAL EMPLOYMENT IN THE PHILIPPINES - OCTOBER 1968

(in thousands)

	Agriculture-Based Nonagricultural Employment1/											
			Urban Places in Agricultural Regions									
Type of Employment	Rural Areas (includes towns under 2,5002/)		Towns over 2,5003/		Regional Centres4/		Totals		Urban/ Export Enclaves5/		Totals	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Nonagricultural Employment	1,957	40	1,427	30	220	5	(3,604	75)	1,192	25	4,796	100
Nonagricultural Employment with part-time rural employment excluded	1,473	34	1,427	33	220	5	(3,120	72)	1,192	28	4,312	100
Nonagricultural Employment, wage-and-salary only	883	35	794	32	120	5	(1,797	72)	714	28	2,511	100

Source: Bureau of Census and Statistics, "Labor Force - October 1968," BCS Survey of Households Bulletin (1971). (Special tabulations of October 1968 labour force survey data by province or city provided by Bureau of Census and Statistics.)

Notes: 1/ Nonagricultural employment in essentially agricultural regions.
2/ These areas contained 590 towns in 1960.
3/ Covers 609 towns.
4/ Nineteen provincial capitals, most of them chartered cities.
5/ Manila, Cebu, Iloilo, Iligan, Davao, Cavite, Angeles, Olongapo, plus areas classified urban in the provinces of Bulacan, Rizal, and Negros Occidental.

Source: Gibb (1984)

Evaluating Rural Growth Linkages through Employment.

51 The structure of employment in rural regions has been studied directly in the Philippines (Gibb, 1974), Sierra Leone (Liedholm and Chutta, 1976--manufacturing only), Thailand (Binswangen, 1982; Mead, 1984), and Zambia (Milimo and Fisseha, 1986). In addition, employment estimates have been derived (Gibb, 1984) from value-added data from a study (Bell, Hazell, and Slade, 1982) of a Malaysian region closely comparable to the Philippine region. The Asian data uniformly suggest that consumer activities are of dominant importance (well over 50 percent) in generating rural non-agricultural employment, that agro-service activities account for less than one-quarter, and that public service activities are surprisingly large, though apparantly a declining proportion of the total as incomes rise.

52 The composition of the activities as measured in terms of their employment reflects a systematic set of household demands for consumer goods and public services, it being easy to perceive a scale running from necessities to luxuries, measured in terms of the relative amounts of employment associated with each.

53 The elasticity of non-agricultural employment with respect to agricultural output and income changes was clearly robust, consistently measuring at least 1.0 with elasticities running to as high as 2.0 in the case of relative luxuries. Table 2 provides illustrative data on the composition, relative magnitudes, and income elasticities of full-time non-agricultural employment in a rural area. The data are from a case study of a prospering micro region of Central Luzon characterized by a

Table x 2

PHILIPPINES

Full-Time Employment in Non-Agricultural Activities
in a Central Luzon Micro Region - 1971

Functional Class Industry	Formal Sector	Informal Sector	Totals Amt.	Totals %	Output or Income Elasticity 1961-1967	Output or Income Elasticity 1967-1971
Agro Industries	1,232	-	1,232	13.5	N.A.	N.A.
Rice Milling and Trucking	730		730	8.0		
Other Primary Agro Industries	265	-	265	2.9		
Machinery Related Activities	237	-	237	2.6		
Consumer Industries	3,324	2,343	5,667	62.3	1.5	1.4
(Local Consumer Industries)	(2,690)	(2,343)	(5,033)	(55.3)	(1.7)	(1.3)
Retail Trade	700	1,233	1,933	21.2	1.4	1.1
Personal Services	346	770	1,116	12.3	1.6	1.5
Recreational Services	60	240	300	3.3		
Bakeries	101	-	101	1.1	1.9	1.8
Clothing-Related	208	100	308	3.4		
House Furnishings/Components	122	-	122	1.3	1.7	1.8
Light Transport Services	1,153	-	1,153	12.7	1.9	1.1
(Specialty Industries)	(634)	-	(634)	(7.0)	(0.4)	(1.9)
Fiesta Bands	150	-	150	1.7	-0.3	-0.2
Footwear Mfr.	346	-	346	3.8	0.5	4.6
Furniture & Other Mfrs.	138	-	138	1.5	1.6	1.1
Export Activities	125	-	125	1.4	N.A.	N.A.
Ladieswear Mfr.	65	-	65	0.7		
Needlework	60	-	60	0.7		
Public Services	1,560	-	1,560	17.2	N.A.	N.A.
Education	892		892	9.8		
Medical Services	124		124	1.4		
Government Services	457		457	5.0		
Utilities, etc.	87		87	1.0		
Construction Related Activities	411	100	511	5.6	N.A.	N.A.
Contractors	196	100	296	3.2		
Materials Supply/Mfr.	215	-	215	2.4		
Totals	6,652	2,443	9,095	100	1.5	1.1

Source: Arthur Gibb, Jr., "Agricultural Modernization, Non-Farm Employment, and Low-Level Urbanization". Ph.D. dissertation, University of Michigan, Ann Arbor, 1974.

sub-region center, three local trade centers, and a total population of 107,000

Evaluating Rural Growth Linkages through Expenditures.

54 Detailed regional studies of household expenditures on non-agricultural goods as a function of agricultural income changes have been done using the same methodology in Malaysia (Bell et.al., 1972), Nigeria (Hazell and Roell, 1983), and India (Hazell, 1986). This research measures linkages from agricultural growth in terms of the value-added increase stimulated in non-agricultural activities as a function of a unit change in agricultural value-added. The estimated multiplier effect on the non-agricultural sector varied from 0.8 in Malaysia to 0.6 in Nigeria. (The Malaysia and Nigeria results are compared further in Section III, below.) The composition of household expenditures by product class estimated in these studies is generally consistent with the structure of non-agricultural employment estimated in the employment studies (Gibb,1984), consumption linkages being on the order of three times the size of the production linkages.

Evaluating Rural Growth Linkages through Urban Activities.

55 In addition to the inventories of urban functions in rural development, particularly useful studies have been done by Wanmali in India (1985) and Zambia (1986) through surveying the quantity and location of "rural [non-agricultural] services" and examining how they change as a function of agricultural growth.

Wanmali's approach is particularly interested in whether the provision of public rural services at a given site in a region has a salutory impact on not only where private rural services locate subsequently but also the rate at which they become established. Among other things he has hypothesized that, in a region where the lowest-tier trade centers support only periodic markets due to either low incomes or sparse populations, it may be appropriate for public sector rural services to be provided on a periodic basis through mobile units comparable to those private enterprises employ.

56 As with the other measures of rural growth linkages, Wanmali's work consistently finds non-agricultural activities expanding within the regions at relatively rapid rates when agriculture grows.

Summary of Findings.

57 There is a high degree of consistency among the findings of the several types of studies attempting to measure rural growth linkages. There is not yet enough data across income levels and other conditions to provide a continuous set of parameters, however.

58 What is important first about this research is that it has established the basic facts that in an essentially agricultural developing nation (i) rural growth linkages account for the overwhelming proportion of both the non-agricultural employment and urbanization nationally and (ii) they expand rapidly as a function of rising agricultural output and income. In addition,

it is notable that this is true for developing nations as advanced as Malaysia, Thailand, and the Philippines.

59 For Africa the research results suggest, first, that rural growth linkages will provide a basis for broadly-based development for several decades to come and, second, that the bulk of the linkages take the form of private enterprises which are small in scale and can be counted on to emerge as a function of agricultural advance in regions characterized by smallholder agriculture.

IV. EVIDENCE FROM AFRICA: PLACING THE FRAGMENTS IN A GENERAL CONTEXT

60 Much of the emprical evidence on rural growth linkages in Africa is from relatively low-income or sparsely-populated areas. Nevertheless, despite its fragmentary nature and the distortions often created by government interventions, this evidence still fits the general model of structural transformation in rural regions quite well.

61 The evidence on the structure and functioning of local-level enterprise in particular is consistent with the general model. First, the ranking of goods and services involved on a scale from necessities to luxuries is the same. Second, the income elasticities of demand are broadly comparable. Third, the increasing rather than decreasing demand for locally-produced goods and services as income rises is evident. And, fourth, the relative prevalence and persistence in Africa of village-based, part-time activities is consistent with the hypothesis that this effect is the predictable result of lower incomes and higher travel costs to trade centers.

62 The discussion that follows begins with evidence on the geographic context within which rural growth linkages operate in Africa and ends with discussions of policy liberalization trends as they affect both private enterprise and agricultural prices.

Evidence on Population Distribution and Tertiary Urbanization

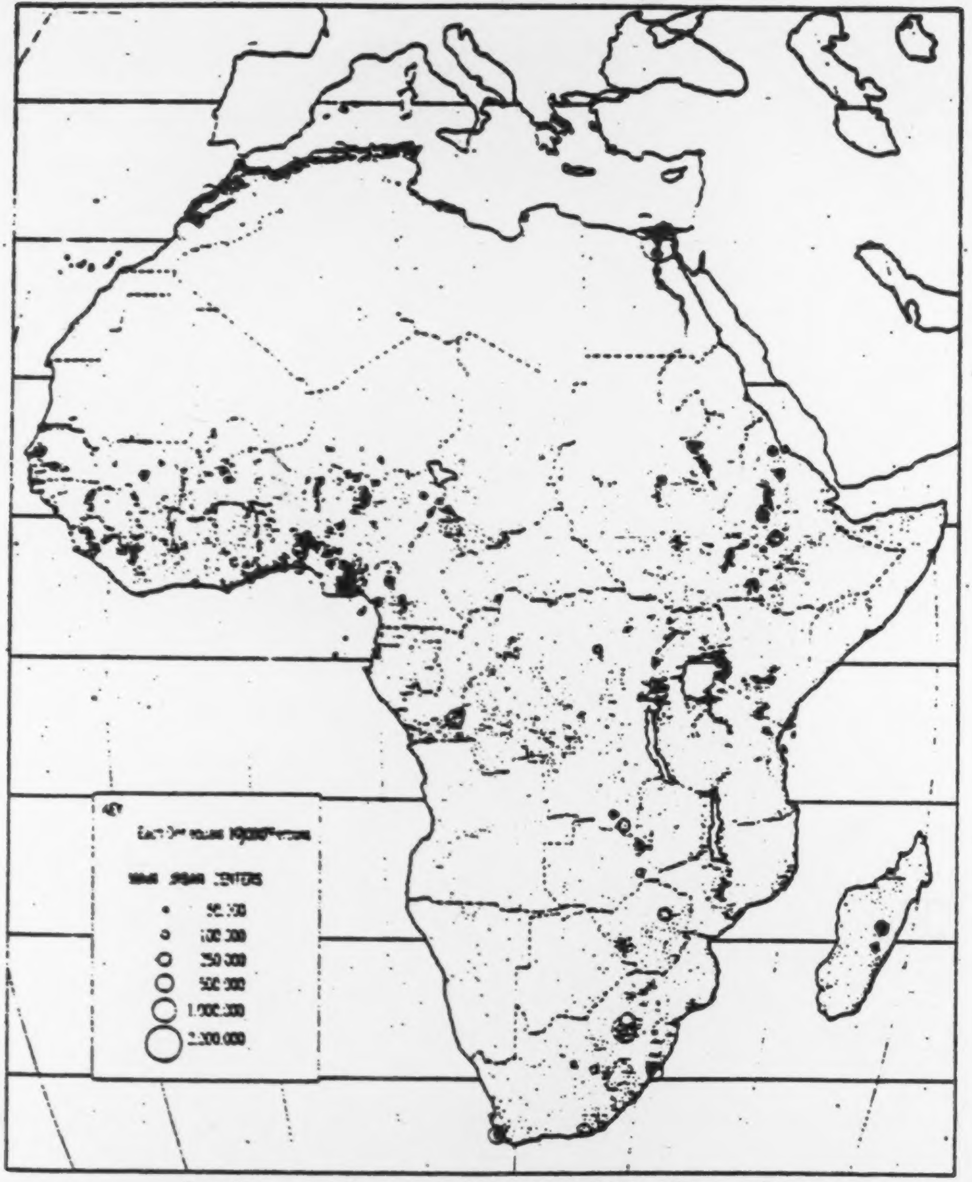
Macroeconomic Evidence

63 Africa's population distribution is suggested, *albeit* crudely, by the map in Figure 1. It is useful in emphasizing how lightly-populated Africa is--having an arithmatic density one-sixth that of Asia and one-eighth that of Europe--and how much of that population is concentrated in easily discernable sub-areas which are relatively densely-populated. However, it should be noted that Africa's physiological population density is still low, that is, it has 1.6 acres of arable land per person as compared with 0.5 in Asia and 0.8 in Europe. (Berry *et al*, 1976)

64 Table 3 presents data on the distribution of population and economic activity in Africa as of approximately 1983. Detailed data are presented for the 15 nations of over five million population which have enjoyed sufficient stability in recent years to allow their statistics to be interpreted meaningfully. These nations account for some 65 percent of the population of Sub-Saharan Africa, exclusive of South Africa.

65 These 15 representative nations are grouped to emphasize their relative weights, population constituting the principal one. It will be noted that Nigeria is of dominant proportions and that Nigeria and Zaire, the only nations above the 20 million range, together account for approximately one-half the total. The only nations in the 20 million range--Sudan, Kenya, and Tanzania--comprise an East African bloc which share both a British patrimony and relatively statist political philosophies.

Figure 1


KEY
Each Dot equals 10,000 Persons
MAJOR URBAN CENTERS
50,000
100,000
250,000
500,000
1,000,000
2,000,000

Population distribution of Africa about 1960. (Courtesy University of Stellenbosch.)

Population Densities and Distribution

It is notable that they account for only 15 percent of Sub-Saharan Africa's total population of 400 million. The next group clusters around 10 million in population and includes four--Zimbabwe, Cameroon, Ivory Coast, and Ghana--whose prospects are relatively bright, plus Madagascar. The four are fairly diverse in nature but have in common relatively vigorous private sectors. The next group of nations range in size from 5-7 million people. Several other nations in this size range were not included because their relatively atypical circumstances are difficult to generalize from, namely, Rwanda and Burundi and four Sahelian nations.

66 The per capita income data provides an average measure of welfare. The Physical Quality of Life Index (PQLI) provides a broader measure of the extent to which basic human needs are being met. It is a simple (unweighted) average of indices of infant mortality, literacy, and life expectancy on a scale of 0-100. In many cases the PQLI is of some use in suggesting how effective government has been in the past in extending public services, especially education and health, throughout rural areas.

67 The structural transformation concept is used to indicate the extent to which these economies are agriculture-based and in the process to illustrate the degree of urban bias reflected in several commonly-used statistics of development. It will be noted that, except where extractive industries are significant (especially Nigeria, Zimbabwe, and Zambia), the basic pattern is for agriculture to account for on the order of 80 percent of the

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Table 3 — SUB-SAHARAN AFRICA: DISTRIBUTION OF POPULATION AND ECONOMIC ACTIVITY

Country	Measures of Welfare Ranked by Population, Income and Region Population (mid-1983) (millions)	1983 GNP pc (dollars)	1981 PQLI	Measures of Structural Transformation Agricultural Employment (share of ~~[illegible]~~ labor force) (%)	Population Distribution Primate Largest City (%)	Secondary ~~Other~~ "Cities" (~~if over 200K~~) (%)	Rural Regions Other Urban (%)	Rural Areas (%)	Total Rural	Agriculture's Share of GNP (%)	Measures of Concentration Mining, Utilities, & Transportation's Share of GNP (%)	Rural Population Concentration
SELECTED NATIONS FOR WHICH DATA MEANINGFUL - (Populations total 256 million)												
Nigeria	94	770	41	54	4	8 (9)	10	78	88	26	29	10-12 nodes
Zaire	30	170	51	75	12	4 (1)	22	62	84	36	10	dispersed
Sudan	21	400	37	78	6	-	14	80	94	34	7	3 nodes in N.
Kenya	19	340	56	78	10	-	7	83	90	33	8	in 2 nodes
Tanzania	21	240	61	83	7	-	7	86	93	52	6	3-4 nodes
(Sub-total)	(185)											
Cameroon	10	820	47	83	8	-	31	61	92	24	21	2-3 nodes
Zimbabwe	8	740	64	60	12	-	12	76	88	11	11	dispersed
Ivory Coast	10	710	40	79	14	-	30	56	86	27	11	dispersed
Ghana	13	310	48	53	13	6 (1)	19	62	81	53	3	1 node in S.
Madagascar	10	310	51	87	7	-	13	80	93	41	15	1 node
(Sub-total)	(41)											
Zambia	6	580	47	67	16	-	31	53	84	14	19	1 node
Senegal	6	440	30	77	22	-	12	66	78	21	9	1 node
Guinea	6	300	25	82	20	-	6	74	80	38	21	2 nodes
Somalia	5	250	17	82	11	-	22	67	89	50	5	dispersed
Malawi	7	210	27	86	3	-	8	89	97	na	na	1 node
(Sub-total)	(30)											

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SUB-SAHARAN AFRICA: DISTRIBUTION OF POPULATION AND ECONOMIC ACTIVITY

Page 2

Country	Ranked by Population, Income and Region: Population (mid-1983) (millions)	Ranked by Population, Income and Region: 1983 GNP pc (dollars)	19[illegible] POLI	Measures of Structural Transformation: Agricultural Employment (share of labor force) (%)	Measures of Structural Transformation: Population Distribution: Largest City (%)	Population Distribution: Other Cities (if over 300s)* (%)	Population Distribution: Rural Regions: Other Urban (%)	Population Distribution: Rural Regions: Rural Areas (%)	[illegible]	Agriculture's Share of GNP (%)	Measures of Concentration: Mining, Utilities, & Transportation's Share of GNP (%)	Measures of Concentration: Rural Population Concentration
DATA FOR NATIONS SUBJECT TO SEVERE CIVIL DISTURBANCE — 76 million pop.												
Ethiopia	41	120	31									
Uganda	14	220	49									
Mozambique	13	na	40									
Angola	8	na	27									
(Sub-total)	(76)											
REMAINING NATIONS: SPECIAL CASES AND SMALL ONES — 61 million pop												
Rwanda	6	270	45	91	5	-	-	95	95	na	na	
Burundi	5	240	35	84	2	-	-	98	98	58	na	
Niger	6	240	27	91	4	-	10	86	96	33	na	
Burkina	7	180	20	82	5	-	6	89	95	41	na	
Mali	7	160	27	73	5	-	14	81	95	46	na	
Chad	5	na	27	85	8	-	12	80	92	na		
(Sub-total)	(36)											
States < 5 million	c. 25											

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which rural populations tend to be concentrated in a small number of relatively densely-populated regions.

Microeconomic Survey Evidence

70 Evidence from a survey of rural service linkages in Zambia which is presently underway (Wanmali, 1986) provides a sense of the state of spatial development in a relatively sparsely-populated area in Africa. The survey area, Eastern Province, has a population of approximately 700,000. Its urban hierarchy is composed of a regional center (the province capital) of some 15,000, five district headquarters (only some of which are towns and thus qualify as "urban"), and approximately 20 central villages.

70 Wanmali is able to compare his Zambia results with comparable research in India (Wanmali, 1985). In a tentative discussion of preliminary results from Zambia (Wanmali, 1986) he notes that the Indian study region has a population density (135 persons per square kilometer) three times that in the Zambian region, has an income level more that twice as high, and has a road network and transportation system that is "far better." Of some 85 services enumerated, all were available in the regional center in each case. However, while less than one-third of these services were available at the sub-region center level in Zambia, two-thirds or more were available at this level in India. Similarly, whereas in Zambia the typical central village has only a primary school and a general store, in India such villages typically have as many as one-third of the 85 rural services.

72 Wanmali's preliminary results on service access indicate the average distance to a local trade center for a Zambian farmer is about 9 kilometers while being about 7 for the Indian farmer. However, the dual effect of low incomes and sparse population is best reflected in the frequency of use and average distance traveled to trade centers of all types. The Indian farmer uses rural services 31 times annually, traveling an average of 10 kilometers, while his Zambian counterpart uses them only 6 times, traveling an average of 15 kilometers. (Wanmali cautions that these Zambian data are quite preliminary.)

73 Wanmali's preliminary data on mode of travel is also instructive. They indicate 60 percent of the travel is by foot, 15 percent by bicycle, 15 percent by ox cart, and 6 percent by motorized vehicle (motorcycle, 1%; public bus, 1%; car, 2%; trucks, 2%). This is a very high percentage of travel by foot, especially when the distances involved are so great. We are inclined to see this proportion as much as a measure of the scope for expansion in two-wheeled travel once agriculture gets moving as it is a measure of the current low incomes and poor roads. And, beyond the bicycle phenomenon, the Asian evidence suggests that at a certain income level vehicle driving for hire becomes a rapidly expanding source of non-agricultural employment in rural areas, an optimistic prospect which could begin occuring widely in Africa within the next five to ten years.

Non-Farm Links Measured in Terms of Employment

74 In the Central Luzon study (Gibb, 1974) non-farm employment was evaluated in terms of its magnitude, composition, and responsiveness to agricultural growth. Full-time employment was found to provide a reliable measure of farm/non-farm linkages and in addition to serve as a proxy for urban growth in rural areas. Part-time employment was found to be a relatively insignificant factor in the local economy since the economy had already become largely specialized as between farm and non-farm activities.

75 There are no studies for Africa measuring the magnitudes of the links between agriculture and local-level private enterprise comprehensively in terms of non-agricultural employment. There is, however, a body of evidence on employment in rural manufacturing which illuminates not only the magnitude, composition, and income elasticity of such employment but also disaggregates it by location. The disaggregation by location often makes it possible to distinguish between part-time and full-time employment.

76 Much of the employment evidence on Africa is the product of efforts by Liedholm and colleagues at Michigan State University under a program investigating the employment-generating potential of rural small-scale industry in Africa. Evidence from Sierra Leone and Zambia in particular is useful in illustrating the role of part-time employment in the rural economy at low income levels and how this in turn is reflected in the structure of tertiary urbanization.

77 The Sierra Leone study (Liedholm/Chutta, 1976) evaluated all

employment in small-scale manufacturing in the country (excluding grain milling), whether part-time or full-time. The data is presented in Table 4. It will be noted the capital city accounts for only six percent of those engaged in such activities, the remainder being in agricultural regions and hence directly or indirectly agriculture-based. Of the total, however, 82 percent occurs in agricultural settlements (villages of less than 2,000) in establishments that have an average of only 1.6 workers. And these workers have a productivity only one-third of that of the 18 percent of the workers who are engaged in "urban areas". The structure of employment and output in this small-scale industry sector is as follows: the 82 percent of the workers in villages account for approximately 60 percent of the total value added in the sector; local trade centers account for the next 5 percent of employment, subregion centers for 2 percent, the four regional centers for 5 percent, and the capital for the last 6 percent; the 18 percent in urban centers account for 42 percent of value added, show little variation in firm size (approximately three workers per establishment), and have essentially similar productivity levels.

78 The composition of this small-scale manufacturing employment in Sierra Leone in terms of types of activities is essentially similar to that found in Malaysia, the Philippines, and India. However, the proportion of village-based activity appears to be far higher, certainly than that in the Philippines. If the village-based workers are assumed to be part-time and the urban-based to be full-time, the evidence can be seen as indicating

TABLE 4

EMPLOYMENT AND VALUE ADDED IN SMALL-SCALE INDUSTRY IN SIERRA LEONE, BY LOCATION — 1974 1/

ISIC	Industry	Rural Areas: Villages Less than 2,000 Inhabitants	Rural Areas: Localities 2,000-5,000	Rural Areas: Localities 5,000-20,000	Localities 20,000-100,000 2/	Agricultural Regions (Sub-Total)	Locality Over 100,000 (Freetown)	Totals
3177	Baking	3,500	206	119	120	(3,945)	164	4,109
3211A	Spinning/Weaving	6,000	126	26	2	(6,154)	-	6,154
3211B	Textile Dyeing	3/	760	114	610	(1,484)	160	1,644
3214	Mat Making	10,000	-	-	-		-	10,000
3220	Tailoring	21,000	1,508	973	1,839	(25,320)	2,380	27,700
3240	Shoe Making/Repair	1,000	18	34	37	(1,089)	131	1,220
331[illegible]	Wood Carving	1,500	76	14	23	(1,613)	4	1,617
332[illegible]	Carpentry	12,500	666	391	628	(14,185)	345	14,530
3720	Goldsmithing	2,500	32	43	47	(2,622)	54	2,676
381.	Blacksmithing	13,000	180	63	46	(13,289)	37	13,326
3819	Welding/Fitting	-	20	7	50	(77)	86	163
9512	Radio Repair	c	12	14	44	(70)	61	131
9513	Vehicle Repair	c	98	102	609	(809)	570	1,307
9514	Watch Repair	c	16	22	40	(78)	76	154
3909	Other Manufacturing	2,000	446	73	273	(2,792)	963	3,755
	Total SSE Employment	73,000	4,164	1,995	4,368	(83,527)	5,039	88,566
	Distribution (%)	82	5	2	5	(94)	6	100
	Workers/Establishment	1.6	2.4	2.4	3.7	(1.7)	3.6	1.8
	Value Added in SSE (Leones millions)	7.7	2.2		1.4	(11.3)	1.9	13.2
	Distribution (%)	58	17		11	(86)	14	100
	Employment in Twenty-eight Large-Scale Industries							4,111
	Value Added in Large-Scale Industries (Leones millions)							17.4
	Value Added in All Industry (Leones millions)							30.6
	Gross Domestic Product (Leones millions)							450.4

Source: Carl Liedholm and Enyinna Chute, The Economics of Rural and Urban Small-Scale Industries in Sierra Leone (East Lansing: Michigan State University, 1976) tables 1, 2, 3, and 4.

Notes: 1/ Small-scale industries are those employing less than fifty persons; in practice 99.0 per cent of the firms employed less than five persons.

2/ Four regional centres which are classified as urban places.

3/ Included in other.

Source: Gibb (1984)

that Sierra Leone's low rural income level is not yet able to support a fully-developed three-tiered structure of market centers, relying in the interim on village-based part-time producers. The structural transformation model suggests that as farm incomes rise and rural transport becomes less costly, these part-time producers will tend to become full-time and to gravitate into the local trade centers, at the same time experiencing a rise in productivity.

79 A more recent survey of rural small-scale enterprises in Zambia using the same methodology produced similar results (Milimo/Fisseha, 1986). This survey of Zambia's rural provinces covered all activities in fixed establishments, excluding grain trading and milling. Rural areas accounted for 84 percent of the employment and 85 percent of the enterprises. Small towns (up to 12,000) accounted for 9 percent of the employment and larger towns (12-50,000) for the last 7 percent, these being interpretable as sub-region centers and regional centers, respectively.

80 Milimo and Fisseha suggest that much of the employment in Zambia's rural areas is full-time in the sense that some work is done in it each period. However, other evidence suggests it may be better characterized as part-time. In particular, preliminary household survey evidence on occupations in the Eastern Region (Wanmali, 1986) shows all repondents claiming agriculture as their first occupation, even when they claim a trade or craft as an occupation. The paucity of fixed establishments outside of the sub-region centers and the apparant importance of periodic markets in central villages has prompted Wanmali to undertake a

survey specifically of periodic activity in order to better understand the role of part-time activities.

Evidence on Expenditures on Non-Farm Outputs

81 An detailed study of farm household expenditures as a function of relative incomes in the Gasau region of Northern Nigeria (Hazell, 1984) reveals a pattern comparable to that found in the Muda region of Malaysia by Bell, Hazell, and Slade (1982) using the same research methodology. Expenditures were disaggregated by 165 classes of goods and services and by income decile of the spending households. Comparable demands for necessities-luxuries (as a function of income level) were found reflected in both the budget shares of each type good and the associated income elasticities of demand.

82 As expected, in the lower-income Gusau region a higher proportion of expenditures went for food than in Muda. In both areas at successively higher income deciles a systematic shift toward "luxuries" occurred. The difference was that in Gusau those luxuries in the main took the form of items to improve the diet (especially vegetables, fruits, dairy products, and meat) rather than non-agricultural goods and services. Whereas in Muda the demand at higher income deciles ran strongly to the locally-produced non-agricultural goods and services which create local jobs and underlie town growth, in Gusau the demand ran principally to locally-produced specialized agricultural products. Thus, the effects of higher incomes and increased specialization

and exchange were principally felt within the agriculture sector in Gusau, although there was growth in demand for non-agricultural goods and services in absolute terms.

83 The highest income deciles of Gusau farm households overlapped the lowest deciles in Muda but the marginal budget shares of those Gusau households for locally-produced non-agricultural products was not higher, as might have been expected. This is tentatively interpreted as evidence that at comparable income levels the higher transportation costs in relatively sparsely-populated areas raise the income level at which demands for town-based goods and services begin to increase at above average rates.

The Vertical Linkages: Evidence on Marketing and Distribution Activities

The Pervasiveness of Private Channels

84 In general the evidence suggests that in most African nations today the full range of private sector local, regional, and national marketing and distibution enterprises is in place and able to respond to meet demands from the local level. It is still common for parastatal enterprises to have an ostensible monopoly in certain product lines but private sector channels often exist side-by-side with the parastatals. Furthermore, Berg (1986) in his testimony to Congress argues that there has been a significant "withering away" of the parastatal channels in recent years due to financial stringencies.

85 In the case of the distribution of agricultural inputs, no evidence was encountered suggesting private sector supply channels were a problem. Jones and Egli (1984) emphasize that for Rwanda, Burundi, and Kivu Province of Zaire the problem is the obstacles to private sector importation of fertilizer, not the availability of private sector channels. Berg (1983) notes that in Cameroon unsubsidized fertilizers were being distributed privately in parellel with those distributed on a subsidized basis by parastatals.

86 With respect to the marketing of agricultural produce, Berg (1986) refers to the "ubiquitous traders" of the parellel markets of Africa and the facts that "...in most of the continent food prices in open markets have been substantially higher than official prices [and] most transactions have already been taking place at market prices." He goes on to note, "Most of such research as does exist indicates that reasonable competition prevails in agricultural markets, which is what one would expect from the structure of these markets--small-scale transactions, many buyers and sellers, easy entry, multiple selling options for producers."

87 With respect to grain trading in Somalia in particular Berg's 1984 report emphasized that the farmer had a number of options as to whom to sell his produce to, namely, either to traders or to assemblers or directly to a mill. The report emphasized that there had been an immediate and considerable entry of generally-young traders into the grain trade when private trading was legalized in 1982.

88 This fragmentary survey evidence on private marketing and distribution channels in Africa is accepted by informed observers as being reasonably representative of the general situation, with the obvious caveats about regions disrupted by war. The weight of the available evidence is that there are extensive systems of private marketing and distribution enterprises throughout Africa, at least down to the sub-region center level.

The Liberalization Record

89 The following quote from Berg (1986) depicts the process of agricultural market liberalization in Africa as of mid-1986. The assessment is generally optimistic, except with respect to the facts that parastatals have tended to keep a fast grip on import and export trade and that British East Africa has been relatively resistant to liberalization:

90 "Liberalization of agricultural markets--greater openness to international competition, reduced control of prices, reduced restrictions on movements of crops and greater reliance on multi-channel marketing--is evident along a wide front:

- Zaire in 1982 completely abandoned its price control system. In 1984 it liquidated its coffee marketing board. In Nigeria commodity boards were eliminated in 1986. In Sudan and Uganda controls on food crop marketing are no longer operative. (Author comment: these nations account for 160 million people or 40 percent of the population of Sub-Saharan Africa.)
- In Senegal the state groundnut and cereals marketing

monopoly was terminated in 1980...[and] marketing was opened to private traders...

- In Mali...coarse grains...and groundnuts marketing has been privatized [and] paddy marketing has been liberalized.
- In Niger [steps are being taken that amount to] abandonment of official price fixing for staples.
- Zambia has made far-reaching changes [toward liberalizing and privatizing food marketing].
- The government of Somalia [now allows private farmers to] lease land...[use] pumps and tractors...[and] sell to private traders...at open market prices, typically 2-4 times as high as official prices...

These examples are indicative of the generally more positive policies toward private agricultural marketing and decontrol of prices that is now spreading in Sub-Saharan Africa. However, this policy shift is not universal. It is not observable in such countries as Ethiopia, Kenya, Zimbabwe, and Tanzania. (Comment: these countries have a total population of 90 million or some twenty percent of Sub-Saharan Africa.) And in some nations the tendency is the other way--Rwanda and Burkina Faso, for example. Progress is especially slow in some areas: for example export crop marketing and import of major staples remain mainly in the hands of state monopolies." (Berg, 1986)

91 Table 5 summarizes the status of economic liberalization as of early 1987 for the fifteen representative African nations so far as it has affected private enterprise and foreign exchange

rates. Table 6 provides specific information relevant to the agriculture sector, including information on agricultural prices and whether crop marketing is controlled.

92 The rhetoric of these nations, with the exception perhaps of Tanzania, has turned sharply away from socialism and in some cases has explicitly embraced free market economics. This rhetorical change is more pronounced with regard to areas in which government involvement had become unsupportable--as in domestic crop marketing--and is less noticeable in areas where government monopolies are sustainable, and even lucrative, as is the case with export crop marketing and food importing. Where there is a sustainable vested interest, the political instinct is to remain rigidly statist.

93 It will be noted in Table 5 that the lists of specific enterprises that have been closed or privatized seems quite random and is not very informative beyond indicating that specific actions have indeed been taken. The more interesting items--because they are systemic--are the cases where a policy has been adopted to not subsidize parastatal any longer. In most cases this action principally reflects a simple budgetary inability to continue subsidizing them, and closure may not be long in following. The principle does leave open the possibility, however, of parastatals continuing to function, but according to commercial groundrules and in competition with private enterprises. From the point of view of the smallholder, there is nothing inherently wrong with such a solution so long as policy does not favor the parastatal over private enterprises.

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Table 5 - STATUS OF ECONOMIC LIBERALIZATION EFFORTS IN SELECTED AFRICAN NATIONS
(as of mid-1987)

Country	Public Philosophy toward Economy	Parastatals Closed, De-subsidized, or Privatized since '82	Scope for Private Enterprise Broadened	Burden of LSI Protection on SSE	International Financial Cooperation	Currency Values + Revaluations Since 1982	Movement to Unified-F/X Rate
Nigeria	Essentially free mkt. Actively pro-rural. LSI still protected(?)	Ag mkt'g boards abolished in 1986			Essentially good, though highly nationalistic	Two Tier (began auction mkt Sept, 86): AMR: ↓67% in 9/86 OR: __% of FMR and falling	To be unified by late 87.
Zaire	Largely free mkt.	All parastatals abolished in 82(!)	Import. of petroleum products opened to p.e. in 1984		good	OR: ↓80% in 84 OR: 100% of FMR	Unified
Sudan	Statist, nationalistic, + high-risk. Basically pro-urban F/X rate policy.	(Few if any?)			Poor: Antagonistic + unstable.	Severely over-valued, etc.	
Kenya	Free mkt, but nationalistic + statist in key areas.	Partially privatized Kenya Fisheries Working on Cotton Board.	Wheat import. privatized in 86.		good	Pegged to SDR (managed float) OR close to FMR	Unified
Tanzania	Socialistic, but becoming quite pragmatic in key areas. Public policies often poor.	Subsidies to all para. ended in 86 Ten para. closed.			?	Major deval. in 86. OR __% of FMR.	?

* currency values as expressed in U.S. $ unless otherwise indicated

REPRODUCED AT GOVERNMENT EXPENSE

Country	Public Philosophy toward Economy	Parastatals Closed, De-subsidized, or Privatized since '82	Scope for Private Enterprise Broadened	Burden of LSI Protection on SSE	International Financial Cooperation	Currency Values Revaluations Since 1982	Movement to Unified-F/X Rate
Zimbabwe	Essentially free mkt, but strong mktg boards + ag policies. LSIs protected (?)	(None ?)			Good		
Cameroon	Free market but statist in key areas.				Satisfactory; member of CFA zone.		
Ivory Coast	Free market but privileges for French a source of tension.				Satisfactory; member of CFA zone.		
Ghana	Moving to free mkts - aggressively pro-rural. Unstable?	Re-structuring: food, cotton, state farms, fertilizer, cocoa, Shipping mkts + bds.	Permitted p.e. to: - import farm equip. (83) - export some foods (86) - import fertilizers (soon)		Good (1986 program w/ IMF + WB)	Two-tier (began Sept 86) AMR: ↓ 40% in 9/86 OR: 60% of FMR	To be unified in 1987.
Madagascar		Import/export para. closed. Privatized sugar exports, shrimp fishing, hotel, tree nursery.	Permitted p.e. to mkt rice and export beans.			Devaluations in 83 + 86. OR __% of FMR CFA member?	
Zambia Senegal Guinea Somalia Malawi	info to come; AID info fragmentary - in general, significant steps have been taken to liberalize in each country						

REPRODUCED AT GOVERNMENT EXPENSE

requiring continuing financial support from international agencies.

Ethnic Minorities and the Marketing and Distribution Sector

96 Much tends to be made of a widespread fear on the part of African govenments that liberalization of the distribution sector could cause a resurgence of economic domination by ethnic minorities, mainly foreign ones (Levantines in the west and Asians in the east) but also specific African ethnic groups. Private opinions have suggested this may be an excessive generalization from East African animosity toward Asians. It has been suggested that in West and Central Africa where there are traditional indigenous trading groups the foreign ethnic minorities are not really feared.

97 The evidence on the durability of widespread networks of private distribution enterprises throughout Africa argues for encouraging the acceptance of such enterprises--especially those that are owned by foreign ethnic minorities--as constructive, long-established elements of the economic system. Systems of ineffective government controls have often had the effect of forcing distribution underground, where the enterprises may have become more exploited than exploiting. Moving towards free markets and encouraging distribution firms to participate in national programs to foster smallholder agricultural advance could have the perhaps unintended result of legitimizing the place of the ethnic minorities involved, to the benefit of social and political as well as economic cohesiveness in the nation. In

any case, program design should be cautious about the representativeness of the view of the African politician on this aspect of policy reform since it cannot always be assumed that he is either knowledgeable, or disinterested, so far as liberalization of the marketing and distribution sector is concerned.

Agricultural Price Policy Reform

98 In general agricultural price policy in Sub-Saharan Africa is trending toward a set of free market prices and there is less scope for raising rural incomes through changing relative price levels internally than there has been in the past. The heaviest remaining price-distortion burden on farm income derives instead from overvalued exchange rates.

99 Systematic evidence on the status of price policy reform in Sub-Saharan Africa and on the effects of reform on agricultural output is beginning to become available. A recent A.I.D. report on the effects of price policy reform in four nations--Mali, Somalia, Zaire, and Zimbabwe--came _inter_. _alia_. to the following conclusions:

> "There is clear evidence that farmers responded to free markets and price signals and made choices that maximized their welfare....Reforms led to significant increases in food production....donor-assisted policy reform programs were the dominent causes of increased food output...The major beneficiaries were small farmers....Policy reforms promoted private sector development in rural areas. The

> level and efficiency of private sector trade in farm products has increased. As rural incomes improve, consumer goods are becoming more widely available outside the major cities." (Haykin, 1987)

100 Price policy basically influences three agricultural prices--those of staple foods, those of export crops, and those for fertilizers. Table 6 reflects the facts that food crop prices already tend to be market-determined and that fertilizer subsidies are tending to be reduced or removed. Export crop prices still tend to be controlled. Liberalization of them is severely constrained in two ways. First, the underlying domestic price is depressed by overvalued exchange rates. Second, governments rely on levies on these crops for revenue and thus find it difficult to reduce the spread between the official producer price and the world market price expressed in local currency. The result tends to be an inflexibly low producer price, one which currently must reflect low world market prices in addition to the depressing effects of overvalued currencies and heavy taxation. (See also Berg, 1986.)

101 The present prospect is for both agricultural prices and foreign exchange rates in the fifteen representative African nations to continue to trend toward free market rates. As is reflected in Table 5, there is steady pressure, accompanied by the needed financial support, from international financial agencies attempting to move these African nations to both unified foreign exchange rates and currency values which approximate free market levels.

102 The tendency toward market-determined staple food prices is a function of sheer financial incapacity. The many official producer prices noted in Table 6 are only meaningful if funds are available for crop purchases so that the official price becomes a floor price. Most African nations lack the capacity to finance such purchasing programs. The risks of such programs in cases where they do is forcefully illustrated by the current dilemas of Zimbabwe and Mali. In 1986 in these two nations the good crop caused the free market prices to drop, the government buying program to invest substantial funds in purchases above that price, and the governments now to be burdened with large storage costs and surpluses that can only be sold at a loss. The A.I.D. report noted:

> "Price interventions are extremely difficult to manage. Many reform programs linked liberalization with a series of support prices. In general, supporting high prices in the face of supply gluts is too much of a drain on government resources. Both Somalia and Mali were forced to suspend price support activities. Zimbabwe has been forced to reduce its support prices in the face of enormous grain stocks which it cannot afford to maintain. African governments do not have the resources to follow the types of farm programs pursued by Western countries."
> (Haykin, 1987, p iv)

103 Fertilizer prices are likely to move to free market levels as a function of the progressive freeing of the markets for them. Freeing the markets eliminates the cost of the subsidies

Table 6 - STATUS OF AGRICULTURAL MARKETING DECONTROL AND PRICE POLICY LIBERALIZATION

OP: "official price"

Country	Food Crops (excluding exportables)	Export Crops	Degree of Subsidy of Agricultural Input Prices
Nigeria	Free mkts (are some OPs)	Free mkts (Mktg bds abolished, 86)	Falling (86)
Zaire	Free mkts	Free mkts (but OP for cotton)	
Sudan			
Kenya	Mostly free mkts. (grain mktg largely freed in 86) OPs on maize, rice + wheat.	Controlled mkts (mktg bds; OPs)	(Nominal prices of fertilizer + seeds raised annually.)
Tanzania	Mostly free mkts, though mktg bds still handle: -10% of maize -30% of rice -50% of wheat (OPs on rising trend.) 84-87	Controlled mkts (tea, pyrethrum) Mktg bds on self-financing basis. OPs on rising trend (86+87).	"Food + ag subsidies eliminated" (84)
Zimbabwe	Largely free mkts. OPs at FM levels for maize, sorghum, + groundnuts.	Controlled but well-run co-op system.	
Cameroon			
Ivory Coast	No OPs.	OPs	Fertilizer subsidies eliminated (83-86)

Table 6 (Cont'd) - STATUS OF AGRICULTURAL MARKETING DECONTROL AND PRICE POLICY LIBERALIZATION

Country	Food Crops	Export Crops	Degree of Subsidy of Agricultural Input Prices
Ghana	Largely free mkts. Most OPs abolished recently.	Controlled but liberalizing. Private exporting of food permitted; cocoa + cotton bds being restructured	Subsidies being reduced steadily (since 83)
Malagasy	Free mkts. OPs for rice abolished (75)	Largely free mkts. Exporting agency closed (83) OPs on rice, coffee, + vanilla.	Fertilizer subsidies eliminated (86)
Zambia	Free mkts (?) No OPs (11/86), except for maize.	Controlled (mktg bds)	Subsidies reduced (73-86).
Senegal	Free mktg; parastatal's withdrawing; OP for rice	OP for groundnuts.	Fertilizer subsidy reduced.
Guinea	Mkts ?	Nominally controlled OPs on coffee + palm kernels PE may now buy + export.	
Somalia	Largely free mkt; (grain trade liberalized it	Largely free mkts??	
Malawi	OPs	Controlled, but by reasonably well-run co-ops. OPs -	Fertilizer subsid. reduced (85, 86

and increases availability, though at a higher price.

104 Export crop prices will mainly be helped by further currency devaluation, although any steps to allow private trading is likely to cause some rise in price as well. Reduction of the levies on these crops is not predictable, it being only secondarily a matter of agricultural price policy.

V. PRIVATE ENTERPRISE ROLES AND POLICY POSSIBILITIES

105 This section discusses the specific roles that private enterprise can play in promoting smallholder agricultural advance. It assumes a region which is relatively densely populated and where the agricultural regime is essentially unimodal. It is also convenient to assume that the region involved is far enough along in the structural transformation process to be fairly well endowed with farm-to-market roads and primary schools.

106 It will be noted that most of the policy possibilities mentioned imply indirect measures that might be taken to improve the environment within which the private sector operates. The discussion assumes that there is a national effort to promote smallholder agricultural advance and that this effort includes an active program of policy analysis and reform able and willing to pursue the policy changes needed to enable the private sector to support smallholder development. The discussion also assumes a macroeconomic environment which is reasonably well-balanced--in terms of fiscal, monetary, and foreign exchange policy--and which includes agricultural price policies which offer smallholders positive incentives to increase their productivity.

Private Enterprise and Inducing Technological Advance

107 Promoting technological advance among smallholders in Africa today is mainly a question of induced technological diffusion. Narrowly defined, it involves the identification or development of improved agricultural techniques through a national research program and the subsequent promotion of its widespread adoption through channels which proceed down the urban hierarchy to the local trade center and then out to the farm community at large. Broadly defined, induced technology diffusion in addition includes the problems of input supply, price policy as regards both inputs and outputs, assuring a sufficient rural transportation system to enable the information to flow out and the marketed surplus to flow back to the hierarchy of urban places, and assuring sufficient marketing services so adoption of the technique will be worthwhile.

108 The possibilities for private enterprise to play a role in induced technology diffusion vary depending upon the technique involved and how the effort is organized. At one extreme would be the case where the technique involved no commercial inputs--say, a land management technique--and where the government was committed to providing marketing services. An intermediate case would be where the technique involved significant commercial inputs--for example, new seed varieties and agricultural chemicals--and the government, while committed to actively participating in both input supply and output marketing through a parastatal organization, permitted parellel participation in

these activities by private enterprises. The other extreme would be the case where the government was committed to playing the central role in induced technology diffusion but also to maximizing private sector participation. In this case most research, at least initially, would probably be done under the auspices of the national research program, and the extension service would play the central--though not necessarily largest--role in the diffusion process. Private enterprise would participate as certified seed multipliers and distributors, as suppliers of information, agricultural chemicals, tools, and credit, and as providers of transportation and marketing services.

109 Seed multiplication and distribution can be accomplished under contracts with farmers and through established retail distribution networks down to the local trade center level. Assuming no impediments to importation, distribution of agricultural chemicals, and of the information necessary for their use, can be expected to occur spontaneously through retail outlets in response to increases in demands for them, at least at the level of the region or sub-region center where there are warehouse facilities. How active a role commercial distributors will play in promoting the use of the new seeds and fertilizers depends on how effective government efforts are to engage their energies. Vigorous promotion normally will depend upon programs being instigated at the national levels of both the extension service and the agricultural chemical distributors.

110 When the technologies needing to be disseminated do not

require commercial inputs, the scope for participation by the private sector distribution channels is more limited, but not eliminated. In the first place, retail trade channels are in general a primary channel of information dissemination in the countryside. Things agricultural are of interest in all walks of life. Thus, properly inspired by publicity campaigns and success stories, traders and merchants of all types can play a role in spreading information about agricultural technical change. In the second place, as a practical matter most technology diffusion efforts are likely to have some commercial dimension since even with technical innovations which use entirely local resources there are likely to be some purchased inputs. In sum, most technology diffusion is likely to involve commercial transactions in some degree, however small, and to be able to involve enterprises which are in a position to disseminate information relatively authoritatively.

111 The question of a role for private enterprise in the forward linkages from agricultural growth is independent of the question of whether the source of that growth involved purchased inputs or not. If an increase in the marketable surplus occurs, a demand for marketing services in effect arises. The focal point of this activity is the commercial warehouse closest to the farm, which in Africa today is likely to be no closer than the sub-region center. Below these are the temporary collection points operated by traders where the typically small sales are purchased, sorted, sun-dried, graded, and aggregated into standard commercial-size bags or lots. From here they are transported by vehicle to a

warehouse, usually the nearest one. Processing, depending upon the crop, may occur at any point up the marketing chain, although in Africa today it is likely to occur near the point of final sale if it is capital-intensive.

The Roles of Local Private Enterprise

Activities Which Are Growth-Stimulating

112 The sources of agricultural productivity growth are principally the availability of: improved techniques, the commercial inputs they require, and the credit needed to purchase the latter. Local private enterprises--mainly agricultural chemicals retailers--will by nature attempt to disseminate information on new techniques, and to some extent to provide production credit, as ways to promote sales of agricultural inputs.

113 Agricultural chemicals retailers can contribute powerfully to promoting agricultural productivity growth if they are harnessed to a government campaign to disseminate a specific package of information on a new technique which requires some purchased inputs. Indeed, once a campaign has been designed and initiated--say, involving demonstration trials, simplified literature on cultivating procedures, and kits of materials for trial private plots--these private enterprises tend to quickly become the principal channel by which the package of information is disseminated, doing so more broadly and effectively than government agencies can.

114 Other measures that can be taken include:

- (i) encourage agricultural chemicals retailers to extend production credit to local farmers;
- (ii) encourage local ownership of cargo vehicles by encouraging the extension of credit for this purpose through private sector sources;
- (iii) encourage local ownership of processing and storage facilities through appropriately designed credit programs.

These measures will usually best be implemented through, and in collaboration with, regional or national firms. More detailed discussion of them is therefore deferred to the discussion of the roles such firms can play in promoting agricultural growth.

Activities Which Are Growth-Dependent

115 The activities which directly stimulate growth account for little employment--less than 5 percent of full-time non-agricultural employment in a rural area would be a reasonable rule of thumb. The remaining 95 percent exists directly or indirectly as a consequence of the agriculture sector having produced a marketable surplus.

116 Measured in terms of employment, the agriculture-based activities at the local and sub-regional level account for the largest part of the typical African nation's private sector. They tend to be highly-productive in their use of capital and tend to contribute to improved economic equity to the extent that they are geographically dispersed. Thus, these activities

warrant a prominent place in any program to mobilize the private sector in support of smallholder agricultural development.

117 In general, aiding rural non-agricultural activities must be done indirectly, especially through relieving them of policy biases which discriminate against them and through various measures to promote rural financial market development. Their needs will be discussed here under the headings "consumer industries" and "agro-industries and public services."

The Demand-Driven Consumer Industries

118 Local enterprises which provide consumer goods and services to rural households can account for two-thirds or more of full-time non- agricultural employment in a rural area. Their employment can be thought of as being roughly equally divided among the following four major areas of activity, whose functions in the rural economy are self-explanatory:

- light vehicle operation
- retail trade outlets
- trade, craft, and construction activities
- personal services.

These activities are characteristically demand-driven in the sense that there tend to be few constraints to their expansion when demand increases. In general, they are not susceptible to direct assistance, their growth being entirely dependent upon expansion of their market. To some extent, however, they are dependent on non-local resources to operate and grow.

119 A targeted program of microeconomic analysis is usually

needed to review existing employment and enterprise related policies to identify both policy biases and opportunities specific to these activities. (A.I.D. has such an "Employment and Enterprise Policy Analysis" program able to provide technical assistance in this area. It has been contracted to a consortium of the Harvard Institute for International Development, Michigan State University, and Development Alternatives, Inc.. See Young ~~A.I.D.~~ (1984) and Gibb (1983).)

120 Examples of common biases that would warrant correction would include:

- policies that impede the importation of spare parts for small vehicles, motors, or equipment;
- policies discriminating against the importation or production of small tires for bicycles, motorcycles, or light vehicles;
- tariff policies that favor the large manufacturer over the small in the importation of common production equipment, e.g., sewing machines;
- investment policies that allow larger-scale producers to import raw materials without tariff while the competing rural industry must use materials on which duty has been paid.

121 Examples of financing problems needing analysis are the optimal ways to assure adequate credit:

- for financing the purchase of light vehicles;
- for maintaining inventories in retail trade;
- and for both maintaining construction materials

inventories and allowing for some consumer credit
with their sale.

The possibilities here are discussed in more detail below under the topics of supplier credit and rural financial development.

Agro-industries and Public Services

122 Other than the small amount of employment associated with agricultural input supply, the remaining one-third of local employment occurs in the following seemingly disparate set of activities:

- warehousing, processing, and shipping of agricultural produce:
- teaching in primary and secondary schools;
- other public service activities, including local administration and health activities.

Nominally, only the first of these involve private enterprise but the remainder tend to be sensitive to local income levels and initiative, especially so in the case of ones which are supported by fees or local taxes.

123 These activities have a relevance to agricultural growth that extends beyond their simple functions as agro-service or public service activities. It is that they account for most of the people of the community who have education and access to capital. These attributes are key ingredients of both entrepreneurship and a community's ability to organize itself. As such, the people engaged in these activities have a good deal to do with an area's ability to respond to opportunities to increase

agricultural productivity. It is important, therefore, to recognize that the community's intellectual, and to some extent financial, capital is disproportionately represented by those involved in this group of activities, that they are distinct from those engaged in the demand-driven consumer industries (which are characterized by lower levels of education and capital use), and that they account for a significant share of non-agricultural employment. It is also significant that those involved in them have above average income and thus account for a disproportionate share of local buying power.

124 The policy possibilities for enhancing the roles of agro-service and public service activities at the local level are quite varied. They include several whose purpose is to meet the needs of the people involved as individuals. The possibilities will simply be noted here, usually to be expanded upon subsequently under other topic headings. Notable ones are:

- as noted above, credit is needed to encourage the establishment of warehousing, processing, and marketing facilities at the local level and for the purchase of the associated trucks;
- electricity is needed in towns for consumption purposes as a necessary urban amenity; educated people will not live in rural towns without it--and will with it;
- modifying the elementary and secondary school curricula to include agricultural subjects and basic bookkeeping may be useful not only for the

students but also for the effects in involving the teachers in these areas;

- it is often desirable to make it legal for education and health services to be provided privately or on a fee basis in areas where publically-provided services are unable to keep up with demand.

The Role of Regional and National Private Enterprise

The Vertical Linkages: The Marketing and Distribution Sector

125 The principal links that regional and national enterprises provide that support smallholder agricultural growth are in the marketing and distribution--and the financing associated with these activities--of five types of goods: agricultural inputs and petroleum products, agricultural outputs, consumer goods, heavy and light vehicles, and construction materials. Geographically, these links connect the nation's cities, regional centers, and local trade centers.

126 As a practical matter, in a modernizing agricultural area these activities play the central role in disseminating information on new techniques, assuring the availability of agricultural chemicals and veterinarian supplies, facilitating the establishment of local crop collection stations, processing and marketing the crops, providing consumer goods not made locally, supplying the heavy and light vehicles required to move crops, people, and supplies, and supplying the construction materials, hardware, and spare parts the local economy requires.

127 The supplier credit provided in association with these activities accounts for a large part of the credit used in a local economy. Indeed, in rural areas it often effectively serves as a substiute for a rural commercial banking system until relatively late in the process of development. To hinder or disrupt the operations of these distribution and credit systems can be extremely costly to rural growth--concerns about monopolistic tendencies notwithstanding--while on the other hand they are capable of being powerfully harnessed to national programs of rural development.

The Question of Market Power

128 Fears of monopsonistic behavior in private-sector produce marketing tends to be exaggerated and to conceal important relationships and opportunities which need to be understood by policy makers. The first factor is transportation costs. The price offered "at the farm gate"--usually in fact at a collection point--is essentially the urban market price minus costs of transportation, handling, and entrepreneurship. Given the bulkiness of staple crops, they do not have to travel far on unimproved arteries before transport costs take up the largest part of the urban market price. The second factor is competition among buyers. Berg has characterized crop marketing in Africa as highly competitive with a multiplicity of buyers and sellers. When Berg is able to provide evidence that even in sparsely-populated Somalia the farmer has a wide variety of options as to where and how he sells his surplus, it suggests strongly that the

fault is likely to lie elsewhere than with the middleman when farm-gate prices are abysmally low, that is, in a depressed urban food price, in poor rural roads, in a highly-dispersed farm population, in low farm productivity, or in all four. (There is a literature on the proverbial Chinese middleman in Southeast Asia which reaches similar conclusions.)

Opportunities to Develop African Entrepreneurship and Links to the National Capital Market

129 If, based on this reasoning, monopsony is assumed away and private enterprise is deemed acceptable as a way to perform produce marketing, the way is clear to view objectively two other aspects of such marketing. The first is the fact that, with agricultural growth, marketing functions over time tend to move progressively down the urban hierarchy and closer to the farmer. As the volume of marketed output rises to the point where the locality can support one or more warehouses, such businesses will tend to emerge at the local trade centers. This will occur as a matter of economic efficiency whose benefits will accrue first to the businessman in the form of higher returns to investment but subsequently to the farmer as well in the form of higher farm-gate prices. Another dimension of that efficiency is the town growth and the improvement in the spatial articulation of the rural economy that results.

130 The second aspect of the marketing expansion that accompanies agricultural growth are the possibilities it holds to promote African entrepreneurship and to give ethnic minority

businessmen an opportunity to actively participate in the process. It can perhaps usefully be assumed that the line between ethnic minority-owned and African-owned firms lies between the sub-region centers and the local trade centers. As has been noted, the former often have the status of towns while the latter do not. In parts of East Africa such a line has even been drawn in legal terms in that ethnic minorities are not permitted to do business outside of "towns."

131 Given these assumptions and the assumption of impending agricultural growth, it would appear there is an interesting basis for fostering indigenous entrepreneurship at the local level in produce marketing. A key factor in the marketing process is the need for capital in the collection of the produce. Whether the trader buys along an itinerent route among the villages or at a fixed collection point, he or she must have the capital to pay cash. This capitalization everywhere in the world tends to come in important part from above, from the commodity wholesaler to whom the trader sells.

132 As African agriculture expands in the next decade, it will be normal for the expansion in local-level commodity marketing to be financed by wholesalers based at the sub-region or region centers. Whereas previously the African commodity trader may have been only a seasonal agent or employee supplying the sub-region level firm, in the normal course of events those traders able to accummulate capital can be expected to evolve into local dealers and then successively, to the extent they have the business acumen, into cargo vehicle owners, warehouse owners,

and finally local businessmen engaged in one or more commodity-related businesses at the local level, including agricultural produce marketing, fertilizer distribution, building supplies retailing, and credit extension. (The author rejects the notion that Africans are inherently less entrepreneurial than other cultures, there being ample other objective bases by which to explain the relatively low level of entrepreneurial development in some parts of Sub-Saharan Africa.)

133 The common characteristics of these commodity-related activities is that they are capital-intensive and require access to the national capital market, albeit indirectly through downstream loans or supplier credit. Public policy could make a substantial contribution to the promotion of African entrepreneurship as well as to rural growth it it could devise ways to strengthen and dignify these financial links between the emerging local entrepreneur and businessman at the sub-region and region level, regardless of the ethnic background of the latter.

Multinationals, Private Voluntary Organizations, Seasonality and the Role of Women

The Role of Multinational Private Enterprise

134 In the main multinational enterprise (MNE) will play a role in promoting smallholder agriculture when it is functioning either as a national agricultural input supplier or as a national bank. One should not underestimate the reach of the MNE, but it seems unlikely that the multinational manufacturing enterprise

will become a widespread presence in rural Africa in the coming decades, despite the hopes of some that agro-business processing operations may expand considerably in developing nations. They will loom large where they are present, but most rural areas will not have the benefit of having one. As noted earlier, manufacturing in general is not relevant to agricultural growth to the extent that the origin of an agricultural region's imports is not relevant.

The Special Role of the Oil Companies

135 The enterprises which distribute petroleum products have a unique role to play in broadly-based agricultural development due to their twin characteristics of, first, operating throughout a nation's economy geographically and, second, of their typically being agricultural chemicals manufacturing and marketing enterprises as well. Thus, to the extent that an advance in agricultural technique involves the use of agricultural chemicals, the interests of development and of the oil companies is closely identified.

The Comparative Advantage of the Multinational Enterprise

136 Speaking in the main of the international oil companies--although the same is more or less true of multinational banks and agricultural equipment manufacturers as well--the multinational enterprise brings a comparative advantage to national efforts to promote smallholder growth in being inclined to think broadly and long-term, in having relatively "deep pockets", and in being able

to provide the good offices of an outsider at times when it is necessary to harmonize conflicts of interest among domestic parties.

137 As a practical matter, this means that, when the national-level private enterprise distributing agricultural chemicals is a multinational, it may be able to aid an effort to disseminate information on improved agricultural techniques in a number of ways. It can mobilize its distribution network behind the effort, coordinate its efforts with those of the national extension service, provide advice to the extension service, be instrumental in obtaining the cooperation of other national and regional firms in the name of broad-based private enterprise support, and even absorb costs to some extent for "bottleneck" items which the government may be unable to supply quickly for various reasons.

138 In sum, the multinational enterprise under the best of circumstances has both the inclination and resources to not merely collaborate with the government in a national effort to promote smallholder agricultural advance but also to be a key factor in assuring the cohesiveness and coherence of the total effort.

International Private Voluntary Organizations

139 Two types of international private voluntary organizations (IPVOs) active in rural areas in Africa are relevant to this report--those willing to serve as contractors to aid donors and those with independent programs willing to accept supplemental

funding from aid donors. Both groups are distinctive for being able to effectively field and supervise trained manpower at the grass-roots level.

140 The "contractor IPVO" should be viewed as simply a distinctive technical assistance resource. As such its use should be subjected to the same cost-effectiveness criteria as are the other resources provided by donor agencies. In general, therefore, it should be employed only in accordance with over-all program priorities, which generally should favor policy reform over direct technical assistance.

141 The "independent IPVO" is another matter. Assuming it has its own agenda and its resources therefore cannot be substituted elsewhere, its utility as an agent able to assist in promoting smallholder advance will tend to depend on (i) how directly it contributes to that advance and (ii) the extent to which it competes for scarce local resources, such as skilled labor. Where it represents purely supplemental resources, both of its own and ones it may mobilize locally, maximum advantage should be taken of any ability it may have to manage additional resources for high priority purposes. In the opposite case, where the purposes are not of high priority or it competes for development resources, its efforts should not be supported by donor resources.

142 Independent IPVOs can be most effectively used to promote smallholder advance by participating in technology diffusion efforts, which can include farm planning, supervised credit, and "technology package" distribution schemes. They may have a

special comparative advantage with respect to the dissemination of agricultural technologies which use no commercial inputs and also in doing exploratory field work on innovative ways that private enterprise channels might be able to reach out more effectively to the low-resource agriculturalist in sparsely-populated areas. They have no particular comparative advantage in small-scale enterprise development, this remaining an area in which the key is increased demand.

143 The most general role that might be assigned independent IPVOs within a smallholder development strategy might be as agents able to promote development at the local level through promoting self-help organizations of various types. If the IPVOs could be encouraged to play this role and to focus their efforts on central villages in order to foster their development as local trade centers, they might make a particular contribution to smallholder advance.

The Role of Seasonality in Enterprise Development

144 It is unlikely that seasonality of demand for labor will be a significant factor in private enterprise development in agricultural regions in Africa in the immediate future. In principle, cooperative efforts might utilize surplus labor in non-agricultural ventures during the agricultural slack season. In practice, cottage industries and putting-out systems do not typically depend upon seasonal slack in the rural labor market. In addition, it should be noted that cottage industries producing for export from their region are considerably less pervasive in

rural areas of developing nations than is sometimes assumed. The typical rural region has little, if any.

145 The opposite side of this coin is the question of whether non-farm income opportunities for members of smallholder households are seasonal to a significant degree. These opportunities typically are seasonal only in the sense that the tempo of the local economy in general is seasonal. This seasonality in and of itself does not offer significant opportunities to promote smallholder advance.

The Role of Women in the Process of Rural Structural Change

146 Women can be expected to be significant participants in private enterprise at the local level during the process of rural structural transformation in Africa. With the obvious exception of certain Moslem societies, the evidence from around the world is that women tend to be active participants in full-time non-agricultural activities at this level--notably as traders (of both agricultural and non-agricultural products), as service providers in stores, shops, and stalls and in domestic service, and in behind the scene roles aiding husbands in many small enterprises. As a result, it is wrong to assume that the process of structural change is biased against female labor, at least in full-time non-agricultural activities. If there is a general tendency, it is for them to participate fully in its expansion.

147 The shift from part-time to full-time activities in the rural economy tends to affect women differently from men. Some of the changes have been characterized as inherently biased

against female labor. To generalize from particular changes is likely to produce misleading oversimplifications, however. Three tendencies affecting rural female labor can usefully be identified as concommitants of rural structural change:

(i) mechanization--sometimes hand-powered--tends to replace certain traditionally-female drudgery tasks, especially the hand-milling of grain and similar food processing tasks, the hauling of water (when hand force-pumps are introduced), and the gathering of fuel (when kerosene stoves and purchased fuels come into use);

(ii) higher incomes tend to create domestic service opportunities both inside and outside the household (dress-making, hair-dressing, clothes washing, and general domestic service);

(iii) higher incomes tend to create full-time female activities at the village level such as produce trading, livestock raising and trading, and petty trade outlet operation.

148 As described here, these changes in non-agricultural employment are generally positive, either eliminating drudgery within the household or creating new employment opportunities. The principal source of problems occurs when the drudgery jobs have been the province of, and source of livelihood for, individuals outside the household--often the very poor--or when the change is from part-time activity by one group to full-time activity by another, as in the case of the move of an activity

from village to trade center.

149 At the regional and national levels similar expansion of opportunities for female labor can be expected to occur as non-agricultural activity expands, though the comparable opportunities will tend to occur out of sight in the "urban informal sector." The production linkages to smallholder agriculture, however, are unlikely to provide employment opportunities to women at any level, these traditionally being male preserves in most nations.

150 The perspective of rural structural transformation suggests a context in which there is not likely to be much scope for public policies or programs targeted specifically at women so far as non-agricultural activities are concerned. The general conclusion is that, other things being equal, they will gain along with other groups as incomes rise.

151 Where displacement of female workers occurs, the capacity of both the traditional family and the expanding rural economy to support these workers is likely to be greater than is generally assumed, and thus the dislocations of economic advance less than generally assumed. Where this capacity is insufficient, the prospects for government being able to alleviate the situation are not likely to be promising, given the resource constraints on African governments.

VI. THE ELEMENTS OF A SUCCESSFUL PROGRAM TO PROMOTE SMALLHOLDER ADVANCE

152 Which aspects of rural development are central to smallholder advance and which are peripheral? Given the limited capacity of government in many African countries, national efforts to promote growth in a system as dispersed and complex as smallholder agriculture must match up tasks and resources carefully and avoid trying to do too much. The capacity of each resource needs to be evaluated and then all need to be allocated carefully in light of how the total process works.

153 There are four different elements in the private sector as it is involved in smallholder growth, not all of them obvious. First are the farmers themselves. Second are the mainly demand-driven local private enterprises. Third are the regional and national enterprises of the distribution sector, including the multinational enterprises. And fourth are local private organizations able to contribute their initiative and enterprise to the process in a variety of ways. A national program needs to take advantage of all the available resources, conscious of the fact the private sector often is able to substitute for government efforts, thus freeing government resources for tasks uniquely suited to them.

154 In this section the elements of a program to promote smallholder agriculture are outlined. They include four "critical

ingredients," a distinct program for promoting development of trade centers at the local level, and the identification of activities that are likely to have only a limited role in most situations due to resource constraints. The comparative advantage of various types of donors and businesses is discussed at the end.

Four Critical Ingredients

Critical Ingredient # 1: The Government Must Organize to be Effective in Fostering Technology Diffusion

155 There is a formula for making government effective in disseminating improved agricultural techniques which by now is fairly standard--define a managable task, draw in the private sector, and manage firmly. In Asia, where the ecological conditions were relatively homogeneous, defining the task was relatively easy since it could be focused essentially on a single variety of grain and on obviously high-return areas, often irrigated regions. Though Africa may be ecologically and agriculturally more complex (cf. Brown and Wolf, 1985, and Eicher, 1986), the principles are the same--in any one standard region organize around one technique to be disseminated, coordinate government efforts firmly at the regional level, draw in the private sector, and backstop the effort effectively at the national level.

156 The record suggests that only a national effort, nominally headed by the chief of state, can carry the requisite authority

to achieve the required coordination. There have been a number of such national campaigns. The one in the Philippines is especially noteworthy both because of its success and because a detailed record is available of its operations through an autobiographical account by its chief executive officer--*More than the Grains: Participatory Management in the Philippine Rice Sufficiency Program, 1967-1969* by Rafael M. Salas (1985), presently the head of the United Nations Fund for Population Activities.

157 It is possible this account could serve as a blueprint for African national programs of food self-sufficiency. For present purposes, however, it will be drawn on mainly for the illustrative blueprint it can provide and for the term "participatory management" which it coins. The operational arrangements in the Philippines notably included: presidential sponsorship, a national coordinating council with line authority over provincial coordinating councils and agencies, merging of agency budgets, prompt releases of funds, direct communication links to the provinces, carefully coordinated logistical operations, full participation of the private sector including the media, and at the local level a high degree of participation beginning with the "leader farmers" and ending with the primary schools.

158 The term "participatory management" has a double meaning, which is the essence of the lesson the Philippine experience holds for Africa. For while on the one hand the term "participatory" reflects the emphasis on inclusiveness, especially of the private sector and the local-level participants, the term "man-

agement" reflects firmness in the extreme. Indeed, it had a czar-like quality since Salas was at once the "Action Officer" of the program and the Executive Secretary of the Philippines. In the latter capacity he was both the head of the Budget Bureau and of the Civil Service Commission. He acted with great vigor as a manager--he traveled to the field constantly during the first year--and in addition had the stature to place the program largely above politics. The net effect was an essentially technocratically run operation, free of the enervating political intrusions so characteristic of government programs. Such a model may be a necessity in some Sub-Saharan nations.

Critical Ingredient #2: Fertilizer: The Key Change Agent Still

159 Fertilizers tend to be both the key change agent for the farmer and the key organizing agent for the national program. Fertilizers tend to be a proxy for all agricultural chemicals. Though neither fertilizers nor pesticides or insecticides will necessarily be a part of a given new technique in the African context, they will still tend to be central in the demonstration programs, in the organization of the campaigns, and in drawing in the energies of the private sector.

160 The reason for this is that it appears the economics of fertilizer use in Africa are still basically positive. Such evidence as has been reviewed (see especially Jones and Egli, (1984), Berg, (1983), and Delgado (1987)) suggests the following generalizations if fertilizer were to be freely available through private enterprise channels and at its unsubsidized, real foreign

exchange cost: it would be available when and where needed; its nominal price price would be relatively high; its productivity would rise dramatically to the extent that what is available today is often the wrong type of fertilizer available at the wrong time; the net effect would be that its effective cost would be lowered. The guess seems to be that under these free market conditions fertilizers (and other agricultural chemicals) would be used selectively, and probably in greater quantities than present conditions might seem to indicate. At the same time this relatively modest level of use would be serving as a change agent for the community at large, even among the non-users, as all became more familiar and discriminating about modern input use and the sources of supply.

161 The conclusion here is that fertilizers and other agricultural chemicals are an issue of central importance to smallholder advance and need to be addressed comprehensively--as regards their importation, their pricing, their distribution, and their role in any national program of technology diffusion.

Critical Ingredient #3: Light Transportation and Personal Mobility

162 Specialization and exchange requires the ability to get back and forth to a trade center; thus, the light transportation network tends to define the effective extent of an agricultural region (Mosher, 1969; Gibb, 1974). In addition, the effect of personal mobility transcends the direct effects of specialization and exchange, imparting an economic, social, and political

dynamic to a region which is not quantifiable but which is of central importance for the human energies it releases (Gibb, 1985).

163 Light transportation encompasses carts, bicycles, motorcycles, and light three- and four-wheeled vehicles. A countryside littered with deadlined vehicles awaiting spares, tires, or gasoline or where demands for new bicycles or vehicles is going unmet due to supply problems is an economy severely retarded. In such a situation, there is an immediate need to free up the supply channels involved.

164 At the general level, light transport should be targeted for priority attention as the second key change agent. Policy actions needed are likely to include: policy reforms to free supply channels, policies to encourage private financing of vehicle purchases, policies to encourage manufacture of bicycles at the regional level and below, and policies to encourage local construction and maintenance of farm-to-market roads and traces.

165 A possibility for foreign donors that warrants serious consideration is to equip government extension agents in rural regions with motorcycles. It has been well established elsewhere, and has been proven again recently in the case of the Zimbabwe family planning program, that extension agents must have such a means of personal mobility. The motorcycles must to be provided as personally-owned vehicles to assure their maintenance. Doing this also tends to result in their being used as private commercial vehicles, which is a beneficial side effect.

166 A program to provide motorcycles to extension agents

nationally could serve as the focal point of a broad government program to assure that the variety of needs of the light transport sector in rural areas are pursued systematically. In addition, such a program would have the twin effects of accelerating a region's exposure to the economics of such motorized transportation and of causing service facilities to spring up.

Critical Ingredient #4: The Downward Flow of Supplier Credit

167 The downward flow of credit through national and regional private enterprises should be encouraged as the third key change agent. As has been noted, there tend to be five distinct channels: agricultural input wholesalers, agricultural output marketers, consumer goods wholesalers, construction materials suppliers, and light and heavy vehicle distributors. All tend to be based at the regional center and to have access to the national capital market.

168 The deregulation of interest rates in rural regions is the crucial step. Additional useful steps are for the procedures governing secured lending to be streamlined and for the central bank to inform the banking system that it looks with favor on lending to finance supplier credits in rural areas.

169 In Africa encouraging supplier credit will tend to amount to more than simply opening the channels for credit to flow into the rural economy. In general, it would also have the educational effect of acknowledging the importance of the distribution sector. And in many countries where ethnic minorities are prominent in the distribution sector, it would accord these

minorities recognition as long-standing and legitimate elements of the economic system.

The Spatial Dimension: Development at the Local Level

170 Promoting the development of trade centers and the growth of activities within them is only of lower priority than the four ingredients discussed above because it is a qualitatively different issue. The ingredients discussed above, apart from the technology diffusion efforts, in the main require government action through policy reforms to remove obstacles to the workings of the economic system that is in place.

Spatial development and promoting local initiative is likely to take longer and to require more direct government involvement and resources and thus has a longer time horizon.

171 The largely demand-driven local private enterprise will tend to expand with rising agricultural income and will characteristically involve African entrepreneurs. Two measures will facilitate this process--encouraging the construction of marketplaces at local trade centers and encouraging the extension of supplier credit to local enterprises.

172 In addition to facilitating the growth of farm/non-farm linkages at the local level, the construction of marketplaces will enhance the role of the trade center as the focal point of the area's activities and thereby encourage local initiative in social as well as economic spheres. To the extent that supplier credit is provided to new African entreprises by ethnic minority

distribution firms, the latter will be able to take credit for helping promote African entrepreneurship.

173 Provision of electricity in sub-region and region centers for consumption purposes also should be accorded relatively high priority. Educated people will not as a rule accept an assignment or chose to return home to a trade center which lacks electricity. Modern leadership in an area is likely to be seriously weakened to the extent electric power is not available at least down to the sub-region level.

Programs to Be Approached Cautiously

174 There are a number of programs that seem desirable and yet typically are not, at least in the near term.

Subsidized Agricultural Credit

175 The record of subsidized agricultural credit schemes suggests they generally do not work and tend to retard the growth of private sector credit for this purpose. Leonard (1986) discusses this issue thoroughly in the African context.

Rural Financial Market Development

176 This is one of the most important tasks for rural development. However, it cannot wait for the development of formal financial institutions at the local level, this being a long, slow process. What is needed in the short run is interest rate decontrol to encourage both savings and lending in local capital

markets, both formal and informal. The realistic view of rural financial institution development is discussed in Adams (1981).

Cooperatives Development

177 Cooperatives development has a problematic record of success. In general, programs of technology diffusion cannot wait for cooperatives development to provide a suitable vehicle. Resources permitting, co-op development should be pursued vigorously in connection with the development of central villages as local trade centers. However, such activities may have to wait for resources until a second stage of agricultural development has been reached.

Direct Assistance to Small-Scale Enterprises

178 The record here (cf. Haggblade *et al*, 1986; Haggblade *et al*, 1987) suggests small-scale enterprises must be encouraged mainly through macro economic policies fostering rural growth and micro economic policy changes to eliminate biases in favor of large-scale or urban based enterprises. The gist of the assessment among the "Policy and Research Implications" with which Haggblade *et al* (1987) conclude their report reads as follows:

> "7. *Direct assistance programs can be cost effective in promoting RNFE [rural non-farm enterprises]*. Many programs of direct assistance to RNFE, although by no means all, have generated B/C ratios exceeding 1. Least effective in general are programs which aim to provide a complete package of financial, technical and management assistance to

> individual firms....Instead, programs that privide single missing ingredients seem to have fared far better...Credit programs have been most popular. Among them projects providing working, rather than fixed, capital credit have typically generated the highest rates of return....The performance of technical and management assistance projects is not well documented. But evidence to date suggests a mixed record...." (This passage should not be quoted without the permission of the authors.)

It should be noted that in a situation where skilled human resources are the principal constraint on development, a financial measure like a B/C ratio may not adequate capture all the costs of a human resource intensive project. Direct assistance to small-scale enterprise may be most usefully perceived as an enhancing ingredient that can be employed to increase the likely effectiveness of a concerted policy reform initiative aimed at small-scale enterprise development. Such technical assistance providing on-the-ground involvement in the sector is sometimes essential in providing an accurate information link between the policy reform analyses and deliberations and the real conditions in the rural economy.

Electrification of Rural Villages

179 Rural electrification may be beyond the means of much of Africa. Nevertheless, given its popularity, it is worth noting that it has an unfortunate side effect. When electricity is installed, local buying power tends to be redirected from local

goods, especially housing up-grading, to consumer durables which have a high import content and are not made in the regional economy. This is the substitution of capital-intensive, import-intensive goods for labor-intensive and local resource-intensive goods and should not be encouraged prematurely or inadvertantly.

Comparative Advantages of the Various Foreign Actors

Comparative Advantage among Donors

180 Very broadly, the comparative advantages of the various types of donors are as follows:

(a) To take the lead in encouraging a nation to approach smallholder advance with high priority and in a comprehensive and inclusive manner: the bi-lateral donor with which the nation has the strongest commercial, investment, and political ties (usually the former colonial power) and other entities with a major involvement in the nation (for example, the United States and the World Bank);

(b) To foster macroeconomic policy analysis and reform: the IMF and World Bank with other donors, especially A.I.D., in a strong supporting roles;

(c) To foster microeconomic policy analysis and reform: a major bi-lateral donor able to develop and promote links between the analysis program and the government's operational programs; or alternatively, relatively minor but specialized donors who have similar views to those of the major donors might play this role;

(d) To encourage private sector participation: business associations, both local ones and chapters of international associations willing to commit time and resources to such efforts;

(e) To promote grass-roots, people-to-people programs of economic and social advance: international PVOs (ideally cooperating to some degree through a coordinating council at the national level) and bi-lateral donors who specialize in such programs;

(f) To provide technical assistance at the national level to the government's operating programs: the range of bi-lateral and multi-lateral agencies which undertake such programs;

(g) To sponsor specialized, well-funded, often long-term initiatives: private foundations; possibly also specialized investment initiatives by multinational enterprises.

Comparative Advantage among Foreign Businesses

181 Large-scale firms are the most likely to be able to help foster smallholder advance in Africa over the next decade or so. Foreign businesses that are medium or small in scale are not likely to be a significant factor. The exceptions to this rule are likely to be special cases--firms with particular or personal attachments that draw them to the African nation, not the run-of-the-mill small or medium scale firm looking to internationalize its operations.

182 The most likely United States firms are, in order of their

entry chronologically, major chemical companies, feed and seed distributors, and agricultural equipment manufacturers. Financial firms could also play a role by financing marketing and distribution enterprises which provide supplier credit to rural regions. Agricultural produce processors and exporters are possible, but less likely, entrants as well.

VII. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

183 There seems little doubt--based on African evidence, Asian experience, and economic theory which is able to relate the two--that links between private enterprise and smallholder agriculture in Africa are important, either presently or prospectively, and that it is likely that private enterprise will play a key role in any successful program to promote growth in this sector.

184 The evidence reviewed, taken together with the structural transformation model of rural development, suggests three broad conclusions as to what will be central in the process of fostering smallholder advance in Africa. Functionally, the process involves a system of linkages which has production, consumption, and public service dimensions and needs to be dealt with comprehensively. Spatially, while the dynamics of growth derive from above, the weight of the linkages in terms of employment and urbanized populations rests at the local and sub-region levels, where there are crucial needs and opportunities. And, thirdly, the vertical linkages have roles to play in fostering smallholder agricultural advance which transcend the immediate functions of marketing and distribution.

185 On the strategic level, it would seem the time is right to initiate planning for a major policy initiative focused jointly on "smallholder agriculture and private enterprise development." In this view the principal structural changes required in African nations to provide a sound financial basis for their growth are

now in train--the shrinking of government to managable size, elimination of the worst price system distortions, incentive agricultural price policies, equilibrium foreign exchange rates, and, as of mid-1987, even international debt relief. It may be a decade or more before some of the structural adjustment efforts have run their course. But their outcome in most of the principal nations of Africa is much less in doubt than the involved professional must maintain. In the same vein, agricultural technology suitable to African conditions is farther along the development path than is often admitted, there being a considerable store of known techniques--both new and old--that farmers are able and willing to draw on once the underlying economic conditions are adjusted so it is profitable for them.

186 In sum, Africa's economic condition today is far less dire than it seemed just four years ago and there are solid grounds for hope for the future--more realistic, committed attitudes on the part of African leadership; a *de facto* substantial, if informal, commitment on the part of the international donor community to continue to provide the external support Africa needs; and few if any realistic alternatives but to continue on the present path toward economic liberalization.

187 Under these circumstances a strategic initiative focused on smallholder and private enterprise development would have two notable facets--first its intrinsic merits and second the fact that movement forward in these areas will make the later, more difficult steps in the structural adjustment efforts easier to achieve. Difficult reforms are easier to accept in a dynamic,

advancing economy. And some of the private enterprise support needed for smallholder advance--like freeing up marketing and distribution channels--overlap some of the tougher policy reform steps needed to continue moving away from statist policies.

188 The intrinsic merits of a program focused on, say, "low-resource agriculture and private enterprise development" are that it would inherently be concerned with breadth and depth in the development process--breadth in the sense of extending to the margins of the agricultural economy; depth in that it would be concerned with private enterprise at the micro economic level. The latter would have two particular dimensions geographically--the local level, where a total system of mainly-small enterprises is involved; and regionally and nationally, where it would be concerned not only with unshackling the vertical linkages to smallholder agriculture but also simultaneously with unblocking what are undoubtedly the largest channels by which credit can flow down into the rural economy.

189 Such a smallholder and private enterprise focused program would require governments to come to terms both with what their most effective role is in promoting rural advance and with ideological and political hang-ups about the utility of private enterprise in enhancing welfare broadly. There are signs many African political leaders may now be willing to accept these challenges. The potential benefits--in both efficiency and equity terms--of pursuing such a course are hugh, as the rapid improvements in human welfare in many Asian nations over the past several decades attest.

190 So far as the authorizing legislation for U.S. foreign aid efforts is concerned, there would appear to be three particular needs with regard to its ability to foster broadly-based development in Sub-Saharan Africa. The first is that ideally it would be structured to consciously emphasize the important avenues for smallholder advance and, explicitly or implictly, discourage extensive involvement in less important ones.

191 Secondly, it should acknowledge the central role of private enterprise in the process of agricultural advance and emphasize that--beyond achieving something that approximates a market-determined foreign exchange rate--micro level policy analysis and reform must be the principle tools by which to promote private enterprise expansion and effectiveness. This means making a persistent effort to identify key change agents and pursue the removal of specific policy biases, intended or unintended, against them. (See Figure 2 for an illustrative list of macro and micro economic policy analysis objectives.)

192 Third, there are grounds for arguing that smallholder-based rural development should be made the principal focus of the authorizing legislation so far as Africa is concerned. This could include putting the weight of U.S. economic development efforts in Africa behind promoting the adoption of the "participatory management" approach to the problem. This implies a comprehensive and inclusive approach which: (i) organizes government efforts purposefully, (ii) systematically includes all elements of the private sector, and (iii) emphasizes participation at the local level by the farmers, local leaders, the local

Figure 2

Illustrative Policy Reform Objectives

Resident macroeconomic and microeconomic policy analysis units may be needed to be able on a continuing basis to pursue the goals of achieving the following policy reforms:

(i) Move to a producer-oriented set of agricultural prices;

(ii) Move immediately to a relatively free foreign exchange regime, both to foster efficiency and to relieve the business community of the need to operate in the shadows of a black or parallel market;

(iii) Assure that government policies encourage entry and competition in all lines of business and eliminate tendencies toward monopoly, including requiring parastatals to compete and act like private enterprises;

(iv) Assure the free flow of imported spare parts (including tires) for light transport and small motors;

(v) Eliminate preferential treatment for larger-scale enterprises on imports of either production equipment or materials, especially those relevant to rural small scale enterprises;

(vi) Encourage supplier credit in rural areas by exempting transaction credit and equipment finance from interest rate laws and by making repossession of loan collateral quick and easy;

(vii) Encourage African entrepreneurship by assuring that laws encourage the establishment at the local level of African-owned enterprises through the extension of credit, the establishment of agencies, and the establishment of partnerships with regional and national enterprises;

(viii) Encourage financial development in rural areas by eliminating interest rate restrictions on savings accounts and on lending and by establishing specific policies encouraging rural financial institution development.

business community, and the educational system.

Recommendation

193 The optimal legislative approach would appear to be one of putting the weight of U.S. foreign aid efforts behind encouraging African nations to approach smallholder development comprehensively and inclusively. This approach would give priority in U.S. assistance to nations willing to undertake a "national program of agricultural advance, using the participatory management approach." Such an effort would be required to have the following as program components:

(i) A macroeconomic policy analysis program which would analyze and provide advice to the government about possible reforms in both general macroeconomic policies and agricultural price policies;

(ii) A coordinated government program to promote technical change in the production of key crops of the nation, concentrating on a very limited number at any one time and in any one region;

(iii) A microeconomic policy analysis program which would analyze and provide advice to the government about possible reforms in "employment and enterprise policies", this program being focused on policies affecting the private enterprise linkages to smallholder agriculture;

(iv) Organization to assure full and systematic participation of regional and national enterprises in both the design and implementation of the over-all national program;

(v) Efforts to assure the participation of relevant multinational enterprises operating in the nation;

(vi) A program to foster market center development at the local level and policies to make them the focii of local level development efforts;

(vii) Efforts to assure the participation of the nation's communications media and educational system, especially at the regional and local levels; and

(viii) After resources are assured for the full funding and implementation of the above program elements, human-resource intensive programs at the grass roots level drawing especially on local and international private voluntary organization resources when they are available.

A principal U.S. goal of this approach would be to make its contributions in such a way as to maximize the effectiveness of the over-all effort. Thus, the approach would attempt to mobilize and coordinate the resources of a variety of donor nations and international agencies, multinational enterprises, and private voluntary organizations in addition to those of the host country.

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A. Gibb
June, 1987

APPENDIX

LIST OF LOCAL INDUSTRIES1/

Formal Sector Local Industries	Informal Sector Local Industries
Retail Trade	
Consumer Goods2/	Periodic traders,16/ *Sari-sari* stores, Pedlars
Durable Goods3/	
Personal and Recreational Services	
Restaurants; Refreshment Parlours	Refreshment Stands; Mah-Jongg Parlours
Barber Shops; Beauty Parlours	Barbers; Laundering
Billiards; Bowling; Movies	Dance Halls; Casinos
Amenity Shops and Services4/	Domestic Service; Bet Collecting
Light Transport Services	
Passenger Jeepneys	
Transport Shops (Light)5/	
Calesas; Pedicabs	*Calesa* repair
Tricycles	
Trade, Crafts, and Construction	
Trades	
Tailoring	Tailoring
Dressmaking	Dressmaking
Bakeries	
Crafts	Craftsmen
Sash Works6/	
Iron Works	
Furnishings	
Construction	
Construction Contractors	Petty Contractors
Construction Supply7/	Traditional Materials Supply17/
Specialty Industries	
Sandal Manufacture	
Rattan Furniture Manufacture	
Needlework Contractors	Cottage Industry
Other8/	
Public Services	
Government Services9/	
Teachers (Primary)	
Teachers (Secondary)	
Medical Facilities10/	
Utilities; Business and Financial Services11/	
Agro-industries	
Primary Agro-industries	
Agricultural Input Dealers	
Rice Milling and Trucking	
Rice Dealers	Traders of agricultural produce
Other12/	
Secondary Agro-industries	
Service Stations	
Transport Shops (Heavy)13/	
Vehicle Body Builders14/	
Equipment Assembly (Light)15/	

NOTES

1/ Industries cover all known areas of nonagricultural economic activity since 1961.

2/ Mainly dry goods, grocery, and drugstores.

3/ Hardgoods (mainly sewing machines, gas stoves, and radio and watch repair), hardware and electrical supplies, and auto and cycle supplies.

4/ Jewelers, goldsmiths, pawn shops, photo shops, gift shops, newspaper delivery.

5/ Tire repair (vulcanizing) and battery recharging.

6/ Includes furniture finishing and retailing.

7/ Construction materials supply, cement block, and pipe manufacture, and gravel and sand supply.

8/ Fiesta bands plus manufacturers of snack foods, coffins, and clay pots.

9/ Municipal government is principally composed of: Office of the Mayor and Council, Office of the Treasurer, Municipal Police, and Public Works Division (esp. roads and streets). National government maintains in each municipality offices for posts and telegraph, internal revenue, and the Commission on Elections and in addition in Gapan maintains a Court of First Instance, a vehicle licensing office, an Office of Agrarian Counsel, the Court of Agrarian Relations, a Land Reform Office, and the National Irrigation Authority office managing the Peñaranda River Irrigation System.

10/ Includes hospitals, clinics, private practices, and Rural Health Units.

11/ Various business and financial services.

12/ Includes egg and vegetable dealers, cargo jeepneys, layer chick producers, and wineries.

13/ Mechanical repair or metal work (welding) shops.

14/ Rice truck body manufacture, jeepney body rebuilding and repair.

15/ Thresher assembly and maintenance, water pump assembly, and battery building.

16/ Itinerant traders, periodic market stalls, and refreshment stands.

17/ Forest products including firewood gathering.

Annex

PRIVATE ENTERPRISE AND SPARSELY-POPULATED AREAS: EXTENDING AND APPLYING THE MODEL

Sparsely-populated areas were characterized above as ones which inherently have a poorer, and usually drier, resource base. As a result of lower incomes, higher transportation costs, and "thinner" market areas, non-agricultural activities tend to occur mainly on a part-time basis, in the form of part-time producers within the village in the case of locally-produced goods and services and in the form of periodic market traders in the case of those produced outside the area. For more specialized goods and services it is necessary to travel one or two days to a regional, or perhaps sub-regional, center.

In principle, the private enterprise links and the pre-conditions to growth in such an area are the same as in more densely-populated areas. To the extent there is sufficient demand, private enterprises will supply the commercial agricultural inputs needed--better seeds, agricultural chemicals, and veterinary supplies--and will meet the household demands for consumer goods and services through either the part-time village producers or the traders in the periodic markets. These links are, however, less dense and more attenuated than in more densely-populated areas due to lower incomes and the greater distances involved.

Similarly, better roads, improved agricultural techniques, and irrigation remain the principal pre-conditions to agricultural advance. The problem here is that all three are more expensive to supply on a per capita basis than is true for the more densely-populated areas and that as a practical matter many will be beyond the means of the nation to supply through government any time soon.

The first principle in development planning is to be realistic in assessing technical possibilities and resource constraints. In this instance this requires discriminating between viable agricultural areas, viable pastoral areas, and areas which are not economically viable, in this latter case distinguishing between whether this is a short-run or long-run situation. Because these areas have a poorer resource base, there is no question of setting inter-regional equity as a short or medium term development goal. Rather the goal must be to maximize regional advance within the limits of the set of national economic and political goals.

There are several major qualifications to these negative generalizations about relatively sparsely-populated areas. First, most areas have concentrations of populations, pockets of resources, or some comparative advantage which mitigate their circumstances. Second, most have private enterprise links which, though relatively weak, are extensions of those in adjacent more densely-populated areas so that strengthened private enterprise in the latter areas will in turn be able to radiate strength, for example, in improving the availability of agricultural inputs and the associated supplier credit. Third, spillover benefits from growth in adjacent more densely-populated areas can include both lower food prices due to increased supply and opportunities for temporary employment in the latter area. Fourth, and perhaps most important, one should never underestimate the possibilities, once conditions begin to change, for significant technical breakthroughs based on local knowledge, bottlenecks having been broken, or new formal agricultural research.

Possibilities in Viable Agricultural Areas

The actions recommended above for enhancing the ability of private enterprise to promote smallholder agricultural growth in relatively densely-populated areas are all applicable to relatively sparsely-populated areas, although they tend to have less force there. To meet the particular needs of these areas, the following program are likely to be appropiate:

- place increased emphasis on agricultural research tailored to dryland crops and other specific needs and use all forms of private enterprise to help disseminate the resulting technical findings;
- promote the development of periodic markets both by supporting the establishment and coordination of new ones (often in conjunction with provision of rural public services) and by removing obstacles to the movement and operations of periodic traders;
- compensate for the lack of funds for roads by fostering the development of tracks and traces

for two-wheeled vehicles by encouraging local initiative and organization to do it, in the process releasing local energies and decentralizing certain authorities.

Food-for-work programs normally are not appropriate for such areas if they will have a depressing effect upon the price of locally-produced staple foods. Ground-water conditions permitting, the one area in which subsidized programs might in some circumstances prove desirable is in the drilling of force pump wells on individual farms. Their water could be used both for consumption and for intensive cultivation of small areas. A subsidized well drilling program should be operated through private enterprise drillers and could be expected to spawn private enterprises supplying various materials and components.

Possibilities in Viable Pastoral Areas

The private enterprise linkages in a viable pastoral area are essentially the same as those in a sparsely-populated agricultural area, with the obvious exception that improved animal husbandry techniques substitute for improved agricultural techniques as the key prerequiste for growth.

The system of periodic markets is closely comparable in function in these two types of areas, especially to the extent that the pastoralists may have links to settled areas in which they practice agriculture during part of the year.

Water as a pre-requisite is closely comparable as well, except that in a pastoral area its availability is importantly a range management issue. In either case it requires capital that will likely have to be publically provided, although again small force pump wells might prove to be an exception in certain instances.

Programs to encourage the financing of production credit, processing and marketing facilities (especially abbatoirs), retail trade, and vehicles apply here with much the same force as they do in sparsely-populated agricultural areas.

In general, opportunities for aiding these areas directly reduce to attempting to disseminate information on new production techniques, facilitating the availability of production inputs by fostering improvements in the system of periodic markets, and encouraging local initiative and organization. None of these opportunities offer a large role for private enterprise. Nevertheless, though the private enterprise linkages may be relatively thin and attenuated, they will often be the strongest links available through which modernizing influences can be transmitted.

Possibilities in Non-Viable Areas and the Question of Income Transfer Programs

In areas determined to not be viable as a means of supporting their population on the land over the long term, it would appear that temporary relief pending resettlement would be indicated, conceivably combined with a re-forestation program which could provide employment for some part of the population. There would appear to be little scope for private enterprise activities in such an area.

In areas only temporarily non-viable, the question of private enterprise linkages becomes relevant again with respect to the optimal way to handle income transfer programs. Assuming the area to be one ravaged by drought or some other calamity, the presumption is that a set of atrophied private enterprise links still survives or can be revived and that it is efficient to approach the temporary problem of the area in ways which not only sustain these links but possibly also take advantage of them. Food-for-work and direct cash transfers are the two most likely alternatives to the direct provision of relief supplies.

The direct advantages of cash transfer programs highlight the potential role of the private sector in such a situation. When relief is provided in the form of cash, the basis is provided for having the private sector resume its activities in supplying the area--presumably entirely consumer goods, and most of that food. Under the best of circumstances--which means where supplies are ample and monopolistic tendencies are at a minimum--private enterprise can be expected to be considerably more effective in supplying what is wanted when and where it is wanted than government. In addition, it is likely to be cheaper to provide a given level of relief through cash distributions, as compared with setting up a ponderous set of government distribution channels backed up by the efforts of international relief agencies.

An additional advantage of the cash transfers approach, as compared with food-for-work programs, is it leaves the individual free to invest his time in improving his land's ability to retain moisture once the rains return or perhaps in learning about improved tillage techniques. Thus, ideally, when the drought has passed, both the land will be more productive and the private sector will be intact, available to supply production inputs and disseminate information on new techniques as well as to supply incentive consumer goods.

Food-for-work programs seem to be well suited to a situation in which a population lacks the means of sustenance, both because of the direct assistance they provide and because the distributions are unlikely to depress the price of staple foods in adjacent regions. They can be used to build or maintain roads and for re-forestation programs. Design and operation of such programs require considerable administrative ability, however, and as investment activities they may not be as efficient as the efforts of individual farmers improving their own lands. Nevertheless, they may be the best available way to transfer income under some circumstances. Where this is the case, it may be possible for some portion of the payments to the worker to be made in cash, and where this is the case all the arguments noted above favoring cash transfer programs apply.

The principal constraint on undertaking income transfer programs normally is not lack of either money or food but the problem of finding the administrative ability and honesty to operate them effectively. Ideally, the use of private voluntary agencies is a way to surmount this problem. Assuming such a solution, the above reasoning suggests that there are substantial advantages to those program approaches which maximize the use of cash payments and, hence, of private enterprise linkages.

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STRATEGIES FOR DEVELOPMENT OF THE PRIVATE SECTOR AND ITS LINKS WITH LOW-RESOURCE AGRICULTURE

by

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1.0 Introduction: A Framework for Inquiry

1.1 Low Resource Agriculture and Participatory Development. Low resource agriculturalists in Africa remain poor and marginalized because of non-democratic polities, economies, and cultures. The world system has no need for such households, either as producers or consumers. The peasants have little power to change the situation. To escape the parasitism of states and markets, many have sought withdrawal. This political dynamic remains the greatest single factor in the post-independence agricultural stagnation. For these households, the gain of relative autonomy must be weighed against continued vulnerability to the larger system, to nature, and to the overuse of the ecosystem.

1.1.2 Subsistence farmers in Africa, as in the rest of the world, are not inherently conservative. Their pursuit of traditional practices is grounded in experience and aims at maintaining maximum subsistence security. There is no reason to think that most would not welcome development, properly defined: a process of self-directed empowerment in all areas of life. This necessarily involves building new institutions to facilitate democratization and the reduction of stratification. Building on local resources, environmental renewal, and the creation of a post-patriarchal culture are intrinsic elements.

1.1.3 Such a model accords not only with the terms of reference of this study but with a substantial body of theory and practice known as participatory development. That school of thought, while not yet prominant in the United States, has become dominant in several UN agencies, research institutes, and field activities. A suggested guide to its theory and practice is Development by People (Gran, 1983a) with model case studies discussed by Gran (1983b). Other sources include ILO, UNRISD, UNICEF, and WHO.

1.1.4 Participatory development does not assume that most of the poor in Third World societies can proceed on a developmental path simply by their own luck and hard work. Instead, this model calls for catalytic interaction between sub-village and supra-village institutions to break down barriers and build local capacity. Such interaction between more modern and powerful outside entities and the powerless rural poor holds much potential for exploitation, domination, and unequal exchange. Bunker (1985) chronicles this process at work, underdeveloping the Amazon over three centuries. He casts the relationship in energy terms: high energy, modern mode of production inevitably leaches from low energy, less complex mode of production of the subsistence farmer. Thus, any truly developmental interaction must guard against further surplus transfer by rebalancing power and energy relationships. The suitability of any outside institution or process for development must be assessed in such terms.

1.2 Historical context of African private enterprise development. The goal of this paper is the study of one external policy option, the expansion of private enterprise and its impact on low resource agriculture in sub-Saharan Africa. Substantial historical and contemporary evidence exists to judge the appropriateness of such an option. But unless a common agreement is reached on key terms, the contemporary political confusion of public policy will continue. Two matters seem particularly germane before outlining the terms of inquiry and working hypothesis that guides this effort.

1.2.1 The term "private enterprise", like "development", has always been the subject of political struggle. The distinction between public and private in conventional usage is an artifical one that has varied from one society and one era to the next. Every modern enterprise, for example, is inherently dependent upon the public sphere; the symbiosis is much like that of man to the biosphere. The evolution of Western civilization ranges from the ancient Greek view that every activity outside the family is part of the public sphere to one contemporary Western view that the proper role of government ought to be highly limited. Similarly, the words enterprise and entrepreneurial have applied to a wide range of social forms. Individuals can be entrepreneurial, but so can groups in all kinds of institutional settings. The question for the poor Africa household is: under what conditions can outside private enterprise play a developmental role?

1.2.2 To provide the context for an analysis of post World War II evidence, consider first under what circumstances poor households, regions, or countries in modern times have overcome on a mass basis the structural subordination inherent in being at the periphery of the world system. The examples that come to mind are fledgling state socialist experiments, at best partially successful and obviously not mixed systems not based on private enterprise and export-led growth (White, et. al., 1983; also Chase-Dunn, ed., 1982). But if one looks further back in time to 19th century Europe one can find poor European countries struggling against imperial Britain with strategies based on private enterprise and exporting. It is the relative success of Scandinavia, in contrast to Ireland, which seems most relevant to the role of private enterprise in Africa in our era.

1.2.3 Denmark, Sweden, and other Scandinavian countries were poor exporters of primary products in the 1830s. Like many African countries today, they had small populations. Some of their policies in retrospect seem very conventional today: selective delinking and import substitution, selling more and more processed goods with shrewd international marketing, building appropriate capital goods industries, and expanding intersectoral links. But what has been ignored by modern policy-makers are the specific "socio-structural and institutional prerequisites" that could make such capitalist initiatives fairly developmental. These include: the lack of latifundia to impede agricultural modernization; moderate inequality and the potential for a mass consumer society; high average level of education; a politically organized peasantry and labor to counterbalance corporations and the state; and a stable political situation encouraging investment, technical diffusion and infrastructure development (Senghaas, 1985).

1.2.4 In sum, by a combination of accident and design, Scandinavians pioneered the crucial elements of real development. Education built individual citizen ability. Local capacity-building created relatively equitable political dynamics that are the most essential prerequisite to a mass-based economy. With such a democratic framework sufficient social planning took place to assure that when the receipts for exports arrived, they were channeled into expanding a mass consumer economy rather than subsidizing elites.

1.2.5 Unfortunately, no society in either colonial or post-colonial Africa has met these socio-structural prerequisites for development. There is substantial literature (e.g., Palmer and Parsons, eds., 1977, and Coquery-Vidrovitch, et. al., 1983) that examines external initiatives by states, agencies, and corporations in local environments with none of these prerequisites. Colonialism produced certain kinds of export-led growth which profited plantations, mines, the state, and the colonial power, but ignored the development of the majority African population.

1.2.6 It is our contention that large scale private enterprise, whether domestic or foreign, can provide little direct developmental response to the plight of the poor. But it is the hypothesis of this paper that under certain circumstances some forms of private enterprise may help to develop low resource African farmers. To see how plausible or practical these or other initiatives might be, we have examined policies, programs, and projects that have been pursued in Africa in recent years.

to large-scale capital intensive businesses in the urban areas, (for a review of private sector assistance see Hull, chapter 4, 1986).

2.2 The Basic Human Needs Approach and Economic Crisis.

The New Directions congressional mandate beginning in 1973 placed the emphasis in foreign assistance on basic human needs, targeting the poorest of the poor. It was assumed that government should play a dominant role in development. The focus of the Agency for International Development's development assistance was shifted away from the concern with industrialization of the 1960s toward local programs with a strong public sector orientation. One of the key features of the new approach was the attempt to stimulate low-resource agriculture through large integrated rural development programs. Other donor agencies adopted similar basic human needs approaches.

2.2.1 By the end of the 1970s, however, African economies were experiencing severe recession. Per capita output rose more slowly than in any other part of the world. In 1980, the OAU produced a report entitled The Lagos Plan of Action, which called for national and regional integration and relatively less dependence on the international economic environment, (OAU, 1980). The plan contained a broad statement of development strategy, sector by sector, to achieve self-reliant growth. While it did not specifically endorse private sector growth as the engine for growth, the plan did not discourage it either. The theme of self-reliance was sounded again in a declaration by planning ministers at the OAU summit of July 1985. They acknowledged that what their governments were seeking was a complete restructuring of the African economies so that progress would be based on the use of the region's own resources and potential.

2.2.2 In 1979, the African governors of the World Bank requested a review of the causes and potential cures for the economic crisi. In 1981, the Bank published Accelerated Development in sub-Saharan Africa: An Agenda for Action, (IBRD, 1981). The basic doctrine of the report is that of economic neo-liberalism, with an emphasis on export-led growth and profitability. It called for a decreased role for the State in development, except for economic infrastructure to serve the private sector which was viewed as the primary engine of growth. The basic needs agenda and the goal of eliminating absolute poverty was de-emphasized. It was assumed that low-resource agriculture could only be stimulated by policies to promote free market mechanisms.

2.2.3 Accelerated Growth was followed in 1984 by another Bank document entitled Toward Sustained Development in Sub-Saharan Africa. It claimed to build on a concensus of African governments and regional institutions (such as the ADB and ECA) around major policy issues. The proposed program of action had as its starting point for rehabilitation the recognition by governments of the need for reform. These included budgetary and pricing policies to switch internal terms of trade toward agriculture and focus greater emphasis on smallholders rather than large farms. Policy reform would also include institutional support such as marketing, transportation, and finance. In each of these service activities the program prescribed a larger private sector role.

2.2.4 Under the Reagan administration, the New Directions approach came under critical review. The tone for the renewed emphasis on private sector development was set by President Reagan in his speech to the Cancun Summit meeting in 1981. He told representatives of developing countries there that they should rely more on their own initiative, stimulate private enterprise at home, and depend less upon foreign development assistance.

2.2.5 In 1982, AID produced its first policy paper on private enterprise development, (AID, 1982). It stated that the goal of the Agency's private sector initiative was "to foster the growth of productive, self-sustaining, income and job-producing private sectors in developing countries using the financial, technological and management expertise of the private sector, indigenous resources, multilateral institutions and AID resources where appropriate." It directed a refocusing on the importance of free enterprise and the market mechanism in the development process.

2.2.6 In May 1983, the President established a task force on International Private Enterprise to examine how U.S. development assistance could be used to promote investment in and trade with developing countries. The task force concluded in its report the following year that sustained economic growth could only be attained by stimulating the private sector. It bemoaned the strategy of government-to-government assistance of the last 15 years.

It proposed that the Congress provide AID with a new mandate to acknowledge the basic emphasis on private sector development. The task force showed little interest in strategies for stimulating low resource agricultural development. Indeed, the task force displayed more concern with U.S. security and international trade interests than with Third World development, (Hull, 1986).

2.2.7 Following the task force report, AID developed a new policy paper on private enterprise, (AID, 1985). The revised paper revived reference to the alleviation of poverty among the world's poor majority as one of the four principal goals of foreign assistance. It also gave more attention to the indigenous private sector in developing countries than the original paper. It implicitly acknowledged the importance of the "informal sector", noting that it may account for the majority of the work force in many countries. Prescriptions for meeting the long list of constraints to development of this sector began with a strategy of policy dialogue aimed at encouraging host governments to undertake policy reforms. The paper further stated that projects should clearly demonstrate the linkages between the activity which is to occur and progress toward private sector development.

2.3 Report by the Food, Hunger, and Agriculture Subcommittee on Private Enterprise

2.3.1 In July 1984, the President directed the State Department to form a Subcommittee to permit business leaders to share information on Third World hunger problems and address these concerns in a cooperative manner. The Subcommittee presented its report in April 1986. The major recommendation dealt with the question of directing foreign assistance resources to private sector development. It was noted that only about 15% of U.S. economic development assistant is spent on private sector programs, remaining unchanged over a 6 year period despite the Administration's stated commitment.

2.3.2 The first recommendation was that development assistance be administered by a single development finance institution, as is the case already in other major donor nations. It was suggested that this facility should provide investment means and incentives on market terms, encourage private sector investment through risk sharing, and serve as a focal point for U.S. economic development assistance efforts.

2.3.3 Secondly, the report proposed that beginning in FY 1987, at least 30% of U.S. economic development assistance be made available for direct private investment, nearly double the current percentage. It stated that the agricultural sector should be made a priority since it plays a crucial role in producing income. Both indigenous private businesses and U.S. direct agribusiness investors should be eligible to participate in such economic initiatives. The Subcommittee emphasized that the key to developing country food security lies in strengthening the domestic economy - in particular the agricultural sector - thereby increasing purchasing power, (Dept. of State, 1986).

2.4 Compact for African Development.

2.4.1 The Council on Foreign Relations and the Overseas Development Council commissioned a committee to issue a report on African development strategies which was published in December 1985. The report contends that African leaders and their donor friends in the Western world and multilateral organizations have arrived at a new concensus about what needs to be done for Africa. It proposes that the United States take a leading role in creating a compact for African development, (Council on Foreign Relations, Overseas Development Council, 1985).

2.4.2 The program set forth in the report addresses emergency needs, rehabilitation, and long-term development. Strategies for the latter needs include several aimed at low-resource agricultural development:

o Increased investment in African agricultural development, with emphasis on small farms and women previously neglected by aid programs;

o A campaign in research and training to create the human and technical basis for an African Green Revolution;

o Assisting Africa to unleash its own private sector through technical help, improved procurement, and trade reform.

2.5 In sum, the crisis in African economic development has been met with calls from donors for private sector development strategies. For their part, African governments have adopted a stance of general acquiescence toward these proposed new strategies while struggling to chart a course toward economic self-reliance.

3.0 Survey of Private Enterprise Strategies in Africa

3.1 African governments. At the time of independence the attitude of the new African governments toward indigenous private enterprise ranged between hostility and benign neglect. Many opted for strategies of development which placed emphasis on capital intensive industrial growth, relying upon the state as the engine of development. In recent years, however, African governments have begun to experiment with a variety of policies designed to stimulate the private sector. More often than not this has meant incentives intended to entice foreign investors rather than the promotion of indigenous enterprises. The following is a review of three African countries generally considered to be favorably disposed toward private sector development: the Ivory Coast, Kenya, and Cameroon.

3.1.1 Kenya has sought to promote small enterprises beginning in in 1968 with its Industrial Estates. They have provided financial and technical assistance to small scale entrepreneurs, included rural loan schemes. The Estates assist in all aspects of industry formation and management through a system of industrial promotion centers. This program has been supplemented in recent years with a variety of rural enterprise schemes. By contrast, the Ivory Coast has been slow to develop an effective policy of assisting small enterprises. The state has followed a more minimalist approach, relying upon a formula of assistance to privately managed lending institutions. This policy has resulted in the development of a few large-scale enterprises owned by Ivorians and the flourishing of joint ventures controlled in majority by expatriates. The economy is noticeably lacking in medium-sized firms owned and operated by nationals, (Mushi, 1982).

3.1.2 By 1983, after the economies of Kenya and the Ivory Coast had gone into decline, the Cameroonian economy was still growing strong. However, in spite of stated government policies to promote indigenous entprepreneurs, foreign capital continued to play a dominant role. The state's intervention in the economy has generally favored large-scale foreign enterprises. A few indigenous entrepreneurs have been successful in commerical retailing and urban real estate but import and distributive trade sectors are still dominated by foreign capital. The government has attempted in recent years to expand credit facilities for local enterprises through institutions such as the National Investment Corporation, the Cameroon Development Bank, and the National Fund for Rural Development. The latter provides credit to farmers as part of development projects, (Ndongko, 1984).

3.2 Mulitateral donors and foundations. Numerous international agencies and foundations have begun to target assistance to small and micro-enterprises. As early as 1969, the International Labor Organization (ILO) asserted that unemployment was chronic rather than cyclical in developing countries. It undertook a series of studies at country, city, and sector levels focusing on employment generation as a major policy goal. The World Bank published a sector policy paper on employment and development of small enterprises in 1978 which became the basis for increased financial support for the sector in Bank programs.

3.2.1 The African Development Foundation. Patterned after the Inter-American Development Foundation operating in Latin America, ADF was established by the U.S. Congress in 1980 and became operational in 1984. It is authorized to make grants, loans, and guarantees to indigenous African groups and associations in both the public and private sector. Although there is no monetary minimum on the size of grant, the average award has been $70,000 thus far. Most of its projects are small scale and involve self-evaluation techniques designed by project participants. ADF insists on evidence of participation and control of indigenous Africans in the policy and decision-making process. In its list of projects funded in March 1986, ADF reveales an emphasis on low resource agriculturalists and income generation.

3.2.2 The Aga Khan Foundation. Registered in Geneva in 1967, the Aga Khan Foundation has branch offices in several countries, including Kenya. It seeks to promote social development in low-income countries in health, education and rural development. The latter program focuses on income generation and management of renewable resources. Projects experiment with improved methods of implementing agricultural support systems and the timely delivery of credit, seeds, fertilizer, and water. The participation of local people in planning and management of projects is considered by AKF to be of vital importance. AKF is planning a conference on the enabling environment for private sector development in Africa in Nairobi in October 1986.

3.3 Private Voluntary Organizations.

3.3.1. In the 1970s AID's Bureau of Science and Technology initiated a program to explore the dimensions of the small scale enterprise sector. Beginning in 1978, a project known by the acronym PISCES (Program for Investment in the Small Captial Enterprise Sector) surveyed small enterprises in urban areas in the Third World. The prime contractor for the PISCES project was ACCION International. The African component of the project was sub-contracted to the Development Group for Alternative Policies (DGap). Following the publication of the results of the survey, PISCES II was launched to support demonstration projects in four countries. Those in Kenya and Egypt were assisted by ACCION, Partnership for Productivity (PfP), and the DGap. Although targeted at urban micro enterprises, the PISCES program helped to stimulate research and support for rural small scale enterprise development as well.

3.3.2 In a survey of 35 AID-funded projects that promoted private sector developent in Africa, several of them were being implemented by either U.S. PVOs or indigenous PVOs, (Lindsay, 1986). The Malawi Rural Enterprises and Agri-Business Developent Institutions project was assisted by Africare in setting up revoling lines of credit aimed at small rural agribusinesses. VITA (Volunteers in Technical Assistance) was involved in the commercialization of improved portable metallic cookstoves in Mali. PfP projects in several countries were reivewed, including the Togo Sio River Economic Development project. This project aims raising the productivity of 2,000 rural farmers and small businesses in an irrigated area in order to diversify their incomes away from irrigation dependent agriculture.

3.3.3 Other AID-funded private sector projects are being implemented by local PVOs and private institutions. The Commerical Finance Company (KCF), an affiliate of the Kenya Commercial Bank, is implementing the Commercial Bank Program. This project is designed to encourage the expansion of small to medium scale enterprises in rural areas. Targeted businesses are majority Kenyan-owned, agri-businesses using local materials. Of the 82 loans made by the KCF after three years of operation, 52 were to food processors, 23 to agricultural services such as saw milling and ploughing, and the remainder to light manufacturing. In Togo, the National Credit Union Association project is being implemented by the African Cooperative Savings & Credit Association and the World Council of Credit Unions. The project aims at improving the administration of the member unions. The goal is to become 50 percent self-sufficient on dues and fees collected from union members, expanding the network to middle and lower income membership in rural areas.

3.3.4 By the mid-1980s there was an increasing number of PVOs involved in the promotion of small enterprise development. OEF International, a U.S. PVO, focuses its development efforts on low income women. For example, it has provided training and technical assistance to rural women in the drought-affected regions of Senegal to introduce new farming and food preservation techniques.

In Morocco OEF helped create a women's cooperative that produces and markets dolls and honey. The Trickle Up Program (TUP) provides $50 grants to small scale efforts around the world, many of them to unemployed and underemployed women. By 1986, TUP had made grants to 1,750 enterprises in 80 countries to assist in starting or expanding such businesses as fruit and vegetable production and marketing, bakeries, and production of school uniforms.

3.4 Small project assistance program. In 1983, AID and the Peace Corps established the SPA program, intended to join the human resource capabilities of the Peace Corps and the financial resources of AID. Under the program, Peace Corps Volunteers work with community organizations that request funds for a specific project. SPA funding of projects does not exceed $10,000 and may not go beyond one year. Projects targeted are in the areas of food production, energy, enterprise development, and health. A description of the SPA program is provided in the AID and Peace Corps report to Congress, (February, 1986).

3.5 U.S. Private Sector Involvement in Africa. During recent years it has become clear that most U.S. based multinational companies are not anxious to invest in a continent beset by economic crisis and political instability. Despite various Presidential Task Forces on private sector development in selected African countries, few large companies have heeded the call to invest in Africa. The divestment campaign in South Africa has in fact caused some companies to leave that erstwhile goldmine of investment. Nigeria has lost its appeal as well.

3.5.1 Market and Technology Access Project (MTAP). This project funded by AID has undertaken research into the process by which small firms in developed countries (particularly the U.S.) and developing country firms enter into collaborative ventures which involve firm-to-firm technology transfer and improved market access, (Wallender and Plionis, 1986). An MTAP study has examined the needs of small and medium-sized enterprises for assistance in developing new products, accessing international markets, and acquiring more productive technologies in order to become more competitive. It concludes that intermediaries can be instrumental in helping these firms locate and acquire the necessary information and resources to meet these needs.

3.5.2 The MTAP study surveyed ten case studies of companies involved in intermediation, including both large and small enterprises: Sears World Trade, Arthur Young, Intermatrix Group, and Palmer National Bank. It concludes that these types of organizations can play an important role in promoting business relations between U.S. firms and those in developing countries that can provide access to markets, opportunities to license technology, and other cost reductions. In sum, enterprise growth in developing countries will require increasingly complex and sophisticated strategies. Intermediary services can facilitate this in venture planning, coordination, resource identification, and the dissemination of information.

4.0 Institutional Strengths and Weaknesses

4.1 Summary of survey findings. In general, post-war aid policies and the strategies of major supra-village actors in Africa have pursued mandates and policies not directly helpful to low-resource agriculturalists. Often they have reached only a fraction of the more well-to-do: those with the resources, time, and creativity to deal with the demands of modern institutions. Poor African households lack the education and political skills necessary to participate equitably. The spread of market processes in Africa has thus tended to deepen already existing inequalities and social stratification.

4.1.1 The results of such processes, growth or stagnation, have specific implications for low resource households. Market and credit facilities develop unequally toward larger-scale market producers. The imperfect markets serve the small producers, purchasers, and off farm micro-enterprises poorly. While enterprise development does contribute to social change, it is a process often painful to rural women. Men leave to seek work in the modern sector, and women must do all the food production and rearing of children, (Swantz, 1985). The development of inequality works against the mass market and balanced growth, which are essential for authentic development as defined by the scope of work of this study.

4.1.2 Criteria selected to judge the potential of outside actors must thus reflect impact on both the immediate contexts of the diverse poor households and their subsistence struggles and on the larger environment. Western economists look at technology, market structure, credit systems, and related economic variable. Criteria developed from any one intellectual discipline are, however, singularly inadequate (Gran, 1983a; Hill, 1986). Issues of material gain are but one consideration. Issues of spread and equity, of capacity-building and organizational effectiveness, as well as of empowerment and sustainability, are also crucial.

4.1.3 Such a micro-systems perspective reveals only part of the problem and some of the issues which might be raised to judgmental criteria. The household perspective must be brought to bear. Obvious diversities exist: settled versus nomadic households; areas of drought or ecosystem depletion; areas of political or ethnic strife or military struggle; cultural definition of household- and natural family life cycles that determine labor availability; relative accessibility of water and fuel; and cultural norms on sex roles, resource control, and legitimacy. While such diversity means that no project will be very effective without beginning with participatory research (Gran, 1986), it does not mean that no useful generalizations can be made at all about such rural subsistence households.

4.1.4 It is useful here to note the following: lack of access to food-producing resources means a constant subsistence threat. More secure access and thus empowerment will be viewed by households as most important. Male/female relations in many places are exploitative, as African men react to powerlessness in the political and economic spheres by holding onto patriarchy (see

Bisilliat, ed. 1985, and Obbo, 1980). Any developmental answer must include appropriate change in the culture and in underlying conditions. The individual micro-entrepreneur is overmatched by a non-democratic political and economic system. As the Scandinavians have shown, however, quality citizenship, relative equality, and mass-based local organizations are essential prerequisites. Unless outside actors are willing and capable of operating from a version of needs generated by the poor households, it is unreasonable to think that outsiders will be able to produce development. Adrian Adams (1985) has made perhaps the most compelling demonstration of these issues (also articles of 1977, 1979).

4.2 Selected criteria for assessing actors

This combination of complex macro and micro issues suggests that only a few criteria would not very effectively measure the potential of the types of external actors under consideration. But a very large number would be unmanageable. The actors are grouped into governmental institutions, the UN system, external private actors, and indigenous private sector actors. We have selected eight criteria as they might be viewed from the perspectives and contexts of low resource households. Definitions are followed by a quantitative measure and an anlysis of each type of institution.

4.2.1 Criteria for judging effectiveness of actors.

- Values. Poor farmers would first like to know about the values of each of the outside actors involved. What mixture of material and social, individual and community, goals impel action? Are the actors value-driven or purely material and careerist in orientation?

- Intellectual grasp. Organizations might be guided by neoclassical economics or by the limitations of a specific political figure. Conversely, they might be inspired by an interdisciplinary grasp of political economy, culture, ecology, history and technology that is demanded by real development.

- Experiential learning. Successful experience in small enterprise development in the industrial world may be an important, but not sufficient, criterion in itself. Experience with micro-enterprise or rural cooperative development in Africa is also useful, but poor individuals and small groups alone have little chance for sustained development, given the ability of larger public and private actors in Africa to co-opt them.

- Motivations of actor. The other five criteria test the institution's ability to sustain developmental action and linkage with low resource agriculture. The fourth criterion is the sum of motivations provided by the external environment of a would-be development actor. In nearly all the cases to be judged, the mandators of the organizations are far removed from the village level.

- Communications skills. This means not just appropriate language ability, but also the capacity for cognitive respect.

- Organizational effectiveness. This is a question of scale. In general, large organizations following hierarchical norms and blue-print planning are not likely to approach low resource households very effectively.

- **Female empowerment.** Since many households divide both food system labor and its rewards inequitably to the detriment of the woman, the ability to produce cultural rebalancing must be a major consideration.

- Quality of resource flows. Many economic actors offer grants or loans in ways that produce dependancy. A successful approach would provide short term flows that work to mobilize local resources.

4.2.2 Using these eight criteria, we now move to an assessment of the cumulative success or failure of outside actors to promote developmental forms of private enterprise that positively affect low resource agriculture. Most of the institutions have focused on those beneficiaries easiest to reach, typically the well-to-do or average income. Given prevailing cultural, social and political conditions, stratification has grown. The table on the following page reflects the origins of this dominant strand of policy and practice at work. Point values from 1 to 8 have been accorded each institution for each criterion. An ideal organization would be awarded a series of 8 point scores for a total of 64. Numbers accorded are approximate indicators of average behavior (different parts of large organizations or samples of several of the same kind of organization) as judged on the basis of independent critical reading of academic and organizational material.

4.2.3 Selected Actors and Criteria for Effectiveness in Reaching Low Resource Agriculturalists

	Values	Intellectual Grasp	Experience	Motivations of Actor	Communication Skills	Organizational Effectiveness	Female Empowerment	Quality of Resource Flows	Cumulative Score
USAID	2	3	5	4	3	4	3	3	27
OPIC	1	2	1	1	2	2	1	2	12
Europe/bilateral	3	2	5	5	4	4	4	4	30
Afr governments	3	6	5	2	3	2	2	3	26
World Bank	1	2	2	2	2	2	1	2	14
FAO	4	5	5	3	4	4	4	4	33
ILO	6	7	6	6	6	6	6	6	49
UNDP	4	3	4	3	3	3	2	4	26
Large corps	1	4	1	1	1	1	2	3	14
Small foreign corps	3	4	3	3	3	3	2	4	25
Foundations	6	5	6	5	5	6	6	5	44
Foreign PVOs	6	5	7	6	5	6	5	5	46
Local urban bus.	2	5	5	3	5	4	4	4	32
Rural large bus.	3	6	5	3	5	4	4	5	35
Rural small scale	5	6	7	5	6	6	6	6	47
Private coops	8	7	7	8	8	8	7	8	61

4.3 A few points of explanation are here in order. The limitations of governments are substantial: they are large organizations, ineffective in democratic communication with the rural poor. Governments are the terrain of struggle between the dominant private and bureaucratic forces, not those of the poor. Such interests construct a version of the world suitable to their own goals. Major policy-making roles are played by economists who employ neo-classical economics as their primary methodology. But any society is a composite of conflicting value systems irreducible to hypothesis of a single social science. For organizational, political, and cultural reasons, both African and Western governments are ill-suited for local development activities.

4.3.1 There are some European community officials, African government officials, and AID personnel who are well read in development literature, learn local languages, and undertake appropriate field work. But they are a small minority, ill-rewarded, and not an effective cornerstone for development policy. Even those leaders who sincerely profess developmental goals, such as former President Nyerere of Tanzania, have found that good values are not sufficient for effective policy. Problems of bureaucracy, vested interests, ethnicity, and patriarchy are not diminished (see Coulson, 1982, for treatment of Tanzania).

4.3.2 The much maligned UN system varies widely in its ability to approach rural Africa developmentally. Actors with the most money and closest connection to political interests of the industrial North, the World Bank and the UNDP, share all of the limitations of governments noted above. Given their relative political freedom, it is particularly distressing to see how insular such institutions are. Most sections of the World Bank pay little attention to learning available in other parts of the UN system, much less the best of academia or those on the ground involved in project implementation. Working through non-democratic governments and using top-down approaches insures limited access to the poor. The rare exceptions, such as a Bank fund for small farmers in the Cameroon, makes the average look even less defensible.

4.3.3 In the UN system are to be found several high quality development efforts such as the World Employment Program at the ILO, research from UNRISD, social policy and program efforts at UNICEF, WHO, and FAO. Their work has proven the effectiveness of "alternative" development.

4.3.4 Private foreign intitiatives range widely in impact, depending largely on size, skills of participants and degree of corporate self-interest. The critical literature on large multinationals and the global banking system needs no summary; the world debt situation speaks for itself. Some small companies may play more positive roles. Ian Carruthers (1985, 3rd edition) has provided one model for agricultural technology trade. ITDG in London has also developed many ways to work for the improvement of off-farm employment involving both domestic and foreign small enterprise. The African Development Foundation has begun a number of rural small enterprise projects, although it is too early to determine whether they will have a sustained impact.

4.3.5 Also worth noting are joint North-South, French-African private voluntary organization efforts reported by D'Orfeuil (1984) and Joly (1985). Africa is littered with the remnants of small, short-lived success stories. Lifting one's perspective to the global scene affords more hope. This framework permits a final category: the private cooperative federation. Little has yet been learned from the Mondragon experiment in Spain. Africans can learn a lot from Mondragon about how to preserve and promote small group entrepreneuerial efforts.

5.0 Case Studies of Success Stories

5.1 The following are summaries of projects/programs in Africa in which low-resource agriculture is served by private sector initiatives. In each case we examine the source of funding, local conditions, policies, infrastructure, labor, inputs, development impact as elements in assessing success, as well as lessons learned.

5.2 Mali: Five-Year Plan for Gao and Tombouctoo Regions

5.2.1 Source of Funding. Government of Mali, Euro-Action/ACORD, Private Agencies Cooperating Together (PACT), (Gellar, 1981, reviewed in Gran 1983b).

5.2.2 Project Description. Gao and Tombouctoo are regions in northern Mali comprising an area half the size of Western Europe and one of the world's most difficult environments. Europe-Action (EAA) has been working here since 1975 to reinvigorate the existing cooperative structure as the way to move from an emergency relief program to a process of self-sustaining long-term development. During 1975-79, the project emphasis was on loans through co-ops to re-establish individual production. From 1979 to 1984 the focus of the loans was on institutional and capacity development of the cooperatives.

5.2.3 Policies and infrastructure. The project demanded large scale coordination by a a small handful of EAA personnel. They worked with regional and national authorities as well as local groups and leaders. EAA brought in the American PVO network PACT with a small flexible budget primarily for research and experimentation, as well as for training and coordination. Problems confronted during the life of the project included competition among the technical agencies for resources and control, as well as two years of serious drought.

5.2.4 Resources, inputs. The project provided wood stove development for a more fuel efficient model, flood plain development surveys, research on hindrances to the participation of women in cooperatives, and technical aid to livestock and forestry services. The operating strategy of the EAA was to attempt to decentralize project activities, realizing that the co-ops were too big and heterogeneous for effective participatory management.

5.2.5 Project impact. The project managed to decentralize the functions, improving spread and equity effects on project beneficiaries. It helped to diversify activities for women away from reliance upon handicrafts. The number of co-ops was increased as was the range of services. A network of village and community councils was established and their organizational and financial skills improved. Still, only half of them managed to attain financial security.

5.2.6 Lessons learned. The creative management efforts by EAA, PACT and the Malians succeeded in "providing measurable benefits to a larger constituency than perhaps any rural development program in West Africa." The project initiated a process combining short-term survival efforts with long-term development.

5.3 Zimbabwe: Agricultural Sector Assistance Program

5.3.1 Source of Funding. U.S. Agency for International Development program sector grant of $45,000,000 to assist government of Zimbabwe's agricultural budget for each year of sector program and Ministry of Agriculture, (AID, ZASA Evaluation, 1984).

5.3.2 Project description. A large portion of AID's programs focus on improving agricultural production. In much of Africa production has suffered serious reversals in recent years. In one of the few exceptions to this trend, Zimbabwe has continued to maintain an environment conducive to agricultural growth. The AID-funded Agricultural Sector Assistance Program has been touted as a success, (Washington Post, November 20, 1984). Under a five-year program agreement signed in 1982, AID is assisting the government to increase the access of smallholder farmers to needed inputs, markets, and technology. The sector assistance was chosen because it provides greater a development focus and a closer linkage to agricultural policy than the cash grant mechanism often used.

5.3.3 Policies and infrastructure. In 1980, at the time of independence, Prime Minister Mugabe inherited a set of policies and institutions that favored a commercial sector comprised mainly of whites. The majority of smallholder African farmers fared considerably less well. Since then, efforts have been made to maintain and expand the infrastructure serving the agricultural sector. Government policies have promoted an efficient marketing system, favorable farm prices, and one of the best research and extension services in Africa. In 1980 about 40 percent of the land was reserved for 5,000 (mostly white) commercial farmers, while 40 another percent was allocated to 600,000 smallholder Africans. Policy changes have since have been aimed at expanding smallholder ability and incentives to produce, including a dramatic increase in farm credit.

5.3.4 Resources, inputs. The government of Zimbabwe increased access to credit, extension services, and research. New grain deposits and distribution centers were provided for seeds, fertilizers, pesticides and tools. Smallholder credit increased from under 5,000 loans in 1980 to over 70,000 in 1984. At the same time interest rates nearly doubled for both large and small scale borrowers. There was a noticeable shift in the focus of agricultural extension toward small scale farmers.

5.3.5 Project impacts. Government policies have had social and political consequences as well as economic. Farmers have been encouraged to organize themselves into village groups which have emerged as effective channels for the expression of grievances and political leverage. Their voice combined with that of the commercial farmers is now an influence in the political system. In general, however, black Zimbabwean farmers tend to agree that life is better now than it was before independence.

5.3.6 Lessons learned. Critics contend that the program has fallen far short of projections due to lack of funds and commitment on the part of the bureaucrats responsible for it. The goal of resettling low-income families has been abandoned and nearly all of the plots have gone to individual families rather than to the communal or cooperative schemes the government originally advocated. Critics argue that government efforts, while well meaning, have actually favored those who already have land, not the landless classes. They contend that Zimbabwe is on the road to state-led capitalism with socialist experimentation on the side.

5.4 Botswana Irrigated Gardens Molepolole

5.4.1 Source of funding. The Kweneng Rural Development Agency (KRDA), a non-governmental organization in Molepolole, with technical assistance from International Voluntary Services (IVS), and Ministry of Agriculture, (Duggan, 1985).

5.4.2 Project description. Irrigated gardening in Botswana is proving its ability to deliver cash and improved nutrition to the poorest class of rural women. The Molepolole experience is the story of poor women and men tackling problems connected with the process of monetization that have been exposed to for a long time. They are meeting their cash needs through arable agriculture. In 1979, the Kweneng Rural Development Agency (KRDA) prepared a garden site for irrigation and ran it as a single estate for two years. After losing money for two years, the KRDA gave up the gardening scheme to a farmer group - the Tshwaragano Vegetable Production Group - most of whom were women. Each member has a plot on which she/he controls the production and income realized from it. The 33 producers consume some produce but sell most of it to a nearby shop, supplying a quarter of the town's fresh produce; the rest is imported from South Africa. The most popular crops grown are cabbages, onions, beets, spinach, tomatoes, and lettuce.

5.4.3 Policies and infrastructure. The Botswana government engave priority to mining and urban infrastructure in the mining centers at the time of independence in 1966. However, it did not have a policy of promoting productive rural employment. In agriculture, the government was hampered by the absence of an appropriate technical package for increasing smallholder productivity. In time, however, it began to encourage the development of irrigated gardens and group organizations to work them. The largest and most successful garden group in the country is found in Molepolole, and it emerged with little direct government intervention or supervision. The Ministry of Agriculture provided technical assistance in the form of extension workers.

5.4.4 Resources, inputs. The KRDA was founded in 1969 as a vocational training center for primary school leavers. It was under the district and controlled by a board elected by the village. By 1980 it had an annual budget of about $1 million and 210 employees. The government paid some of the costs of the training center and the rest of the deficit was made up by writing new grant proposals. In an effort to trim its budget, the KRDA abandoned its horticulture projects, selling the garden pump and sprinklers to the District. The group of gardeners was then formally recognized by the Ministry of Agriculture. With proceeds from sales, the group buys tools and fertilizer. Because of Botswana's flat topography and semi-arid climate, the few good irrigation sites yielding fresh produce for home consumption and sale to local villagers began to attract the interest of larger entrepreneurs with cash to invest.

5.4.5 Project impacts. The success of the gardens contradicted the conventional wisdom of a national horticulture survey which wrote off the region as suitable for gardening because South Africa was too close and transport there too cheap. It failed to reckon with the willingness of poor women to dedicate hours of hard work to gardening which became their major source of cash income. Many of them were heads of household. Most of them did not cultivate rain-fed crops. The gardens provided a reliable aternative since the Molepolole dam held enough water for the gardens year round. Cash income from the produce was estimated to average between $240 and $500 a year. In sum, the project has benefited poor women by affording them an avenue for access to cash, better nutrition, and greater self-esteem.

5.4.6 Lessons learned. There was no specific policy favoring women which led to the creation of the gardening scheme. In fact most projects that have helped rural women in Botswana have not been aimed at women in particular. Village water supplies and health facilities have helped most. As for productive projects, craft cooperatives have employed women at several sites in the country. Kweneng District had a pottery workshop which is now defunct. However, the Molopolole gardens yield little insight into planning projects specifically for women. Perhaps the most significant observation is that irrigation in Botswana should be considered a means of employing poor rural women. The project also reinforces the lesson that self-employment in agriculture yields greater productivity than wage employment.

5.5 Cameroon Credit Union Development Project

5.5.1 Sources of funding. An AID grant provided $1.6 million, of which $896,000 is categorized as the private sector component, for the period from 1980 to 1985. The project is being implemented by the Cameroon Cooperative Credit Union League and the World Council of Credit Unions. (Lindsay, 1986)

5.5.2 Project description. This project is designed to provide the Cameroon Cooperative Credit Union League with management technical assistance to develop the financial resources and technical ability to offer member credit unions training in financial management, savings, and credit administration. The network of individual credit unions will be encouraged to expand as each union is better able to offer reliable savings and credit facilities, presently absent in the rural centers. Credit programs will be expanded beyond the existing Small Farmer Production Credit (SFPC) program to include non-farm credit.

5.5.3 Policies and infrastructure. The government of Cameroon has long been supportive of liberal economic policies, in comparison with most other African countries. Nevertheless, it has only recently begun to fashion policies specifically designed to stimulate indigenous small enterprises and encourage savings.

5.5.4 Resources, inputs. The AID grant is allocated for technical assistance personnel, credit training and staff support. Other donors have provided staff and funds valued at $3,308,000. The technical assistance to unions includes training in loan application appraisal, loan follow-up and servicing, as well as business advisory services to individuals granted these loans averaging less than $150. A sub-project is designed to evaluate the feasibility of the small non-farm producers credit program.

5.5.5. Project impacts. Targets included increasing the SFPC program from 15 to 28 unions, the loans from 79 to 340, union members to 9168, savings to $400,000, and 420 union officers introduced to the program. As of the evaluation of 1984, the project was found to have attained or nearly achieved all these targets. There were 28 unions in the SFPC, all trained to grant and collect loans. Some 1700 more individual members were recruited that projected. A total of 320 new loans were granted, compared with the target of 340. Savings fell short of the target by $40,000. However, the League was over 97 percent self-supporting from membership dues and interest on invested member savings, excluding assumed costs such as replacing expatriate volunteers.

5.5.6 Lessons learned. Cameroon is being viewed by some other West African countries as a leader in promoting small and medium scale enterprises. This project illustrates an important dimension of business development: savings and financial management.

6.0 Learning from the Past: Designing a More Developmental Future

6.1 Learning as social phenomenon.

Human beings in every era have tended to learn little from the past, and our own era is no exception. The explosion of project related material and foreign area studies over the last quarter century has produced an enormous literary universe. Lessons abound, notably synthesized by Horvat (1982), Gran (1983a) and by Gran (1987, forthcoming) in an annotated bibliography of the current state-of-the-art. But the existence of lessons or their convenient packaging does not guarantee learning. The literary universe remains fragmented between academic and organizational realities. Social science disciplines, foreign languages, cost and distance are all major barriers. Ideology and degree of personal security condition learning. Organizations find new ideas threaten the routine, and thus they structure very little learning into the bureaucratic world. The biggest hindrance is, however, the relationship of learning to one's political, economic, and cultural context.

6.1.1 Learning, in other words, is an inherently social phenomenon. Its definitions and goals are not neutral, objective or scientific. Contrary to the 20th century belief in positivism, all learning involves at least three components: the historical experience and values of the viewer; the place one stands (the social, political, and organizational context); and the actual process of looking or learning. The low resource agriculturalist in Africa does not view success from the same place or with the same goals as do agency officials or consultants in Washington.

6.1.2 AID, for example, has sponsored a series of papers evaluating small and micro-enterprise projects. A recent synthesis report (Blayney and Otero, 1985) focuses on topics of material gain for project recipients. But is has little to say about other components of development such as spread and equity, institutional effectiveness, and sustainability. Their analysis considers how different external actors might improve the effectiveness of individual entrepreneurs, but not how such an individual focus might fail to meet social needs and produce stratification.

6.1.3 This paper has consistently pursued the perspective of low resource agriculturalists in Africa. Thus, this section begins with a cumulative impression of what they would term success for the household level, the village, and for the macro political economy. Few regions in Africa have been able to integrate all the following elements to creat a fully developmental reality; such locales, in Eritrea, for example, remain under-documented (Firebrace, 1985). A more politically practical ideal is possible, especially by going beyond these few cases to include the rich case material in publications from ILO, ORSTOM, and the Institute of Cultural Affairs. From such a version of success it is then possible to judge the effectiveness of recent strategic initiatives and from these to offer some appropriate policy suggestions.

6.2 The Lessons of Success.

6.2.1 Low resource agriculturalists would be likely to accept the assumptions set forth in the scope of work for this study. Solutions must be built on existing possibilities and resources, must embrace current social reality, and begin to realize the post-patriarchal dreams of half the population. Life quality, power, local resource efficiency, sustainability, and enhanced productivity and market access are indeed on their agenda. But to reach those goals, poor farmers must take more control over productive resources by means of social and political processes: empowerment and institution-building.

6.2.2 At the sub-village level the lessons have to do with the individual, small group relations, and power. The poor, as individuals, cannot use political systems, market, credit, or legal system to their advantage very effectively. Horatio Alger myths are not a mass solution. But grouping people in cooperatives under state auspices without cooperatve education works no better. Village level coops are even more open to abuse (Gentil, 1984). What Mondragon and other experiments worldwide indicate is that there is an intermediate strategy which analysts like Horvat (1982) and Sik (1985) term a planned market economy. This strategy rejects the ideological views of human nature propagated by capitalists and Marxists, and argues instead that human beings have both individual and social needs that evolve over time. Economies and polities need to be geared to this complex changing reality. Culture must teach freedom and social responsibility.

6.2.3 Such a process of education, cultural change, and institution-building must precede the arrival of projects, as commonly conceived. The instigators should be indigenous intermediary organizations using trained development catalysts. Proshika in Bangladesh is one model. Participation reseach forms the major part of the process; it serves to raise individual skills and self-confidence, identifies locally felt needs, and develops ideas of group potential (Rahman, ed., 1984).

6.2.4 Minimal political skills, vision, and social connections are just the beginning of development. A successful first stage has at least the following attributes: group effort; committed people with social vision in the leadership; organization with processes for continual learning and decentralized structures and activities making such learning practical; organizational respect for and ability to learn from clients and their environment; relative or complete autonomy from the larger environment; involvement of the poor to the degree they have proprietorship and responsibility; development of a new, more participatory local organization as the vehicle; capacity-building layer by layer from the bottom up; and flexibility of procedures and creativity in funding mechanisms to multiply actual resources. These attributes are expanded upon in a discussion of 18 world-wide cases by Gran (1983b). A collection of similar case material is available from the Institute of Cultural Affairs (1985-86).

6.2.5 Peasants, especially those struggling with few resources, will not willingly allocate labor to problematic alternative ventures when loss of agricultural labor threatens subsistence. Yet they have shown a willingness to place small surpluses in a wide variety of social and economic purposes. They would likely invest in allied or intermediary institutions they can control on a democratic basis, institutions which facilitate equitable access to credit, technology, education, social services, transport, productive inputs and consumer goods.

6.2.6 The Grameen Bank process in Bangladesh illustates how an intermediate credit process might start from the outside: training and small group formation; loans to individuals or groups to ensure repayment, and continued technical aid (Siddiqui in Mukhopadyay, ed., 1985). Compare this to recent surveys of less successful rural credit programs in Africa in Johnny, (1985) and Williams (1985). The Mondragon example, borrowing from neighbors who were investing in the creation of their own future jobs (Henk and Thomas, 1982), seems more suitable. The trade-off is speed versus good habits of self-reliance.

6.2.7 Small groups are more effective than poor individuals in dealing with public and private concentrations, but single small groups are also overmatched. Neither democracy nor development is sustainable in such conditions. This is why we have proposed the multi-level federation of cooperatives (the Mondragon model) as the optimal vision for the next stage of institutional development. Small groups can be as egotistical as individuals. On the other hand, both individuals in the groups and the groups themselves need the freedom to be entrepreneurial and creative. Experience in Tanzania and China suggests that a hierarchical central state cannot avoid "anti-incentivism" and bureaucratic control (Puttermans, 1985). Only as a democratic federation of groups can the poor hope to interact with an extractive external environment in a sustainable, developmental way.

6.2.8 The political dynamic has parallel economic dynamics. Exporting primary products into markets they do not control has proven to be an exercise in underdevelopment for millions of Third World poor. Change the product, change the market, and pursue relative self-reliance in the interim are the lessons Scandinavian history teaches. In contemporary Africa that means democratizing polities, economies, and culture to lay the basis for the necessary local mass market. Balanced local development can only procede so far if national and regional economies are unbalanced. An interim step would be some social planning of balanced provincial or regional development.

6.2.9 Clearly the definitions of public and private now in vogue are passe and not descriptive of such a vision of authentic development. Yet segments of the private sector of our era - especially PVOs, development foundations, indigenous small business, and some small foreign businesses - have a role to play in constructing a more just and sustainable order. These elements of the private sector are stifled and marginalized by the status quo and would prosper in a future so designed. At every stage short term infusions of credit (not, typically, grants) would be useful. Private development foundations could foster credit coops as one second-level entity in a federation. If local private enterprises as well as PVOs and other aid agencies provided some seed money, the credit coop should be able to leverage additional resources from more traditional institutions, heretofore beyond the reach of the poor. Several national development foundations in the Americas seem to be making this work well.

6.2.10 The local federation should create education coops at the second level. They would need help in developing social management skills and facilitating local to local technology transfers. ITDG and ILO/JASPA have made substantial starts toward meeting curriculum needs of technical education. But the development of local agroprocessing will need far more technical and entrepreneurial skill at the local level than the current kind and scale of programs by aid agencies, governments and PVOs envisage. The private cooperative federation should provide a far more effective and socially responsible institutional venue, following the Mondragon model.

6.2.11 A degree of trade will need to be conducted with the larger system. Local groups within a federation can be assisted to find specialized markets. A private marketing coop as a second level entity would be appropriate. Here it is crucial that the primary producer also develop marketing skills to play an effective role. A sad lesson from a major ILO case study review (Muntemba, ed., 1985) is that all too often women played primary roles as producers but subsidiary roles in marketing with less than equitable overall results.

6.2.12 In sum, such a vision of balanced bottom-up development with far more democratic politics and economics relies on local antonomy and creativity of the individual within a group context and groups within a larger social context. To the extent processes or institutions affect people's lives, they should have control over them. Democracy and development are integrally linked. We should put into the trash can of history the institutional greed of contemporary capitalism, the totalitarian impulse of statist socialism, and the awesome inefficiencies, alienation, and inequities of both systems. The best current rendition of this alternative vision is that of Branco Horvat (1982).

6.3 Macro-system development strategies. To what extent, then, do policy initiatives of the national and international authorities help or hinder such self-reliant development by low resource agriculturalists in Africa? This section will consider examples of strategies or policy options. Some have been directed at the macro environment of culture, politics, and economics: education, financial support for export-led growth, political and policy reform aimed at markets, and privatization. Others have been aimed at the micro environment: village and self help projects, off-farm employment and rural industry, small-scale institutional development and training, women's projects, and ecological regeneration projects. These strategies are deemed to be the most germane to low resource agriculture. All of them must be held up to the same test. If the rural poor do not effectively participate in designing and implementing alternatives, it is improbable that whatever outsiders do to them or for them, such activities will produce sustainable development.

6.3.1 Education. One macro policy initiative of aid agencies has been to create a cultural and educational environment suitable for the expansion of a particular variant of capitalism. Myriad speeches, policy dialogues, country and sector assessments and strategy statements, project literature and background research propel a consistent view of modern history, the origins of poverty, the efficacy of the market, and parameters of the possible future. Unfortunately for low resource agriculturalists, this educational effort rests on both conscious and unconscious mystification harmful to their needs.

There is a growing gap between the vision of modern African history in World Bank writings and what either poor Africans or Africanst scholars perceive. In this and every other area of international policy, the state-of-the-art is produced by interdisciplinary academics. What private enterprise has done to poor Africans in the 19th and 20th centuries is the subject of dozens of major works, among which are Palmer and Parsons (1977) and the two volume anthology of Coquery-Vidrovitch (!983). Yet such works are largely ignored by public policy makers. Is it reasonable to imagine that we can have an effective public policy on world development while ignoring these perspectives?

6.3.2 Export-led growth. This has been the major strategy offered Africa by the industrial North over the last quarter century. With a democratic, relatively egalitarian political economy, a society can hope to trade with equals. But such conditions do not obtain in modern Africa. The fruits of exports are siphoned off by elites, enhancing stratification and producing "unpayable" debts. Industrial nations renegotiate debts and demand more exports. Instead of encouraging democratization of Third World polities, the United States and the Soviet Union have consistently used coercion and force to smash such efforts wherever they have appeared.

6.3.3 Institution-building. This has been a strategic element of Western policy in Africa for decades. It has been guided by precepts from public administration and focused on line agencies in African governments. Some individuals may have benefited, but such efforts have not changed the incentive environment in which they work. In cases like Zaire, the result has been to make more efficient kleptocrats (Gould, 1980). In strengthening macro-organizational capability, this strategy simply widens the gap between peasants and the state. No incentives have been provided by the public or the politicians in the North or in Africa to refocus institution-building to the local level and proceed as outlined earlier in this section.

6.3.4 Policy reform. This is a euphemism in the 1980s for a strategy of unleashing market forces as a way of spurring development. The effectiveness of such a policy is a function of the degree of democracy in politics and economics. In stratified societies such a policy reform merely replaces one set of winners with another. Substantial changes in political balances and culture as well as in local and intermediate institutions would be necessary to make the market work to the advantage of low resource farmers. Market forces and signals are not irrelevant and are sometimes unduly stifled by public authorities. But the market without social planning is not responsible or developmental, as the US has demonstrated by doubling its national debt in the last five years.

6.3.5 Privatization. The strategy of privatization suffers similar limitations. Whether a plantation is run as a parastatal or a private corporation does not measurably change the conditions for its workers or for marginal agriculturalists in the area. Stoler (1985) illustrates this in an Indonesian case study. Under coercive pressure from the industrial nations, several African governments have begun to denationalize some economic sectors. This is a result primarily of the weakness of the state in the midst of a debt crisis and poor terms of trade, both contrived by the industrial North with some domestic assistance inside each state. To replace state marketing boards with private traders is to move from one inefficient solution and set of winners to another. Organizing producers to do their own marketing is far preferable. But in a report on this process in Zimbabwe, Bratton (1986) shows that it is wealthy farmers who really participate. The poor will not be well served if they do not organize.

6.4 Micro-system strategies. Can one be more hopeful about micro-system strategies? As we have seen from this review, many types of organizations, large and small, claim to be targeting aid efforts to low resource agriculturalists. In general, the best of these efforts do overcome the blockages described above.

There is direct communication with the poor when the intermediaries are small enough. The poor are drawn into organizations for a productive purpose. Women gain some social and political power and there is some improvement of social services and quality of life. But there are still a billion people in the world unable to secure subsistence on a regular basis. The limitations of current micro approaches remain substantial. A critique of efforts by public and private agencies in the North would begin with the following issues.

6.4.1 The environment for micro approaches. The public in industrial countries remains generally ill-informed about the Third World. High school and college education and the mass media are typically ethnocentric. AID agencies and the PVOs often hire persons who are not properly trained in foreign area studies. The learning environment for those recruited into organizations that focus on small-scale development is not conducive to a solid understanding of development.

6.4.2 Human resources and organizational abilities. To the poor background and training for such agencies, often volunteers, must be added a largely hostile macro development environment. Projects are typically started before the intended beneficiaries have been involved. Small groups become too dependent upon outsiders. Cash grants establish bad habits. Like the larger agencies, the voluntary organizations tend to target those benificiaries easiest to reach. The conventional project process, large or small, condemns the poor to permanent dependency.

6.4.3 Toward a development policy. One can applaud small scale efforts, especially those that empower women and regenerate the environment, but these partial efforts would not provide much of a basis for policy guidance to a future generation of would-be donors and governments. Any policy suggestions would have to be linked to political forces and organizational capacities (that is, an incentive environment) in which implementation could take place. From the vantage point of poor Africans, there is thus far little basis for such hopes. To a large extent, they will have to make their own progress.

6.4.4 The needs for education. Policy advice to any national or foreign institutions would begin with a straight-forward plea for individual and organizatinal capacity-building. The human species has practical answers to the problem, but the center of the culture, as in all eras, resists learning. For the curious minority, a beginning curriculum would be Horvat (1982), Gran (1983a), and Barber (1984). An annotated bibliography of the 500 best sources will appear in Gran (1987, forthcoming).

6.4.5 Thoughts for African governments. Advice to African governments would include the following elements. Grant cognitive respect to the poor, as they have better ideas about local development than do national level actors. Decentralize and democratize politics and economies. Create training schools for social management, worker management, community organization, participatory research, and world system studies. Adopt and adapt the 19th and 20th century Scandinavian strategies, (beginning with Senghaas, 1985) and the Mondragon model. Abolish one-party state systems and encourage the growth of democratic local organizations. Adopt soft-energy paths. Build a post-patriarchal culture. And incorporate ecological wisdom into all strategies. In such a world, low resource agriculturalists should prosper, and small group and individual enterprise could build a balanced and sustainable local and national economy.

6.4.6 Advice to donors. Donor organizations should be advised to work to build the local capacity in Africa in line with the policies described above. A mundane but crucial step would be to fund appropriate intermediaries to build local, regional, and national libraries with state-of-the-art development studies from all over the world. They should not fund non-developmental national authorities, but should support intermediary institutions and independent national and regional development foundations. They should build skills to act as a more developmental presence in public and policy education in the North and South. They should structure learning into the work policy, retrain personnel, and offer promotions on the basis of competency examinations. In sum, they should instill developmental meritocracy.

6.4.7 Advice to the U.S. Congress. Finally, a few words of advice to the members of the U.S. Congress. The current aid legislation suffers contradictions and creates major constraints for AID. But re-writing it will require an informed and committed constituency and thus a substantial amount of education. Ritual aid hearings are not the answer. The Congress should seek to mobilize all interested constituencies, including U.S. small businesses and to build capacity for citizen education. Extensive study of individual projects and of the modern world system should be the initial focus. There should be a reduction in funding for the less developmental parts of the UN system and a reward for the more developmental parts. The UNRISD Africa project in participatory research, for example, could use tangible aid. Last of all, the Congress should realize that until we change the dynamics of the current world system, the low resource farmers in Africa will continue to fare poorly.

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LOW-RESOURCE AGRICULTURE IN AFRICA

STRATEGIES FOR DEVELOPMENT OF THE PRIVATE SECTOR AND ITS LINKS WITH LOW-RESOURCE AGRICULTURE

by

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Revision of

Strategies for Development of the Private Sector and Links with Low Resource Agriculture

Paper presented to the Office of Technology Assessment

by Galen Hull and Guy Gran

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1. Private Sector Strategies of Agencies and Organizations

In our initial draft of this paper we described in sections two and three some of the strategies for development articulated by African governments, donor agencies, and private voluntary organizations. That exercise was a bit like the story of a man who came across a drunk on his hands and knees, groping around underneath a corner street light. Out of curiosity, the man asked what he was looking for. The drunk replied that he had lost a quarter. Taking compassion on him, the man thought to help the drunk so he asked exactly where the quarter was lost. To which the drunk pointed down the street. Puzzled, the man said: "Why are you looking here, then?" The drunk smiled broadly and replied: "Well the light's a lot better here!"

We are a little like the drunk, looking for linkages between low resource agriculture and the private sector. There is virtually no mention of the term "low resource agriculture" in the literature regarding private sector strategies of development. The reviews of our draft pointed out that we made no mention of linkages to low resource agriculture in our survey of African government policy statements, AID and World Bank policy papers, presidential commissions, and private voluntary organizations. This is because the documents consulted do not explicitly explore these linkages. We have examined several of the sources suggested by the reviewers and note the general absence of the use of the term here as well. Discussion of non-farm activities centers on the role of small scale industries in providing productive employment and earning opportunities in rural areas, without reference to low resource agriculture as such. Perhaps this is simply a matter of semantics. Rather than to belabor this point, we have structured our response so as to reflect the findings and terminology in the literature.

2. Private Sector Strategies: Review of the Literature

Concern for equity and employment during the 1970's led to an awareness that strategies focusing on large scale industrialization in the developing world had not been successful in achieving development objectives. Hence, interest in small scale industries as an alternative development strategy to enhance the private sector evolved. Until recently, sources of information about the composition and functioning of this "informal" sector were rare, other than ethnographic studies of rural markets which seem not to be widely read in donor agency circles. Decisions regarding the sector by governments and donor agencies were thus generally made in an information vacuum.

• Empirical data on small scale industries

A sustained effort was begun by a handful of scholars to collect empirical data on employment in the rural nonfarm sector. The Department of Agricultural Economics at Michigan State University undertook a series of surveys of small scale industries in African countries such as Sierra Leone and Nigeria. Under contract with AID, MSU produced numerous papers reporting on empirical evidence from these surveys. The most recent of these is entitled Small Scale Industries in Developing Countries: Empirical Evidence and Policy Implications (December 1986) by Carl Liedholm and Donald Mead. The authors present findings from a dozen countries, of which six are African. Only six of the twelve were in-depth studies, two of them in Africa.

Liedholm and Mead conclude that small scale industry can be an important vehicle for meeting the growth and equity objectives of developing countries. Empirical evidence, they maintain, indicates that "much of what is small is indeed beautiful." They summarize the salient features of small scale industries, which are defined as those with fewer than 50 workers employed in manufacturing activities or related repair work. Although small, they account for the vast bulk of industrial employment and are engaged in production of light consumer goods such as clothing and furniture. Virtually all of these small firms are privately owned and in many countries significant numbers of owners are female. The majority of industrial firms in most developing countries are located in rural areas. Employment generated in the rural units often exceeds that generated by all urban industrial firms. Many of these firms are one-person operations, and most of them employ fewer than five persons. Proprietors and family workers generally form the largest component of the small industry work force; apprenticeship labor is particularly important in Africa.

In most countries, the average person engaged in small scale industry does not work full-time in that activity over the entire year. Frequently they work part-time in other activities such as farming. The amount of capital used by most small scale industries is rather modest, as is their initial capital stock. In contrast to larger firms, the majority of funds for establishing or expanding small firms is derived from personal savings, relatives, or retained earnings. Relatively little financing is derived from commercial banks, government programs, or even money-lenders. Finally, Liedholm and Mead contend that small scale industrial activity appears to have been increasing in absolute terms in most developing countries, even faster than large scale industries in a few countries. And since small firms account for such a large portion of total industrial employment, the absolute increase in employment absorbed by the small scale private sector is substantial.

And what of the relationship of small scale industries to low resource agriculture? Economists look to factors influencing the demand for and supply of small industry goods and services. The overwhelming bulk of the items produced by small industries are light consumer goods, sold directly to rural (and urban) households. As household incomes increase in the rural areas, the demand for a range of small scale industrial goods and services also increases. A second source of demand for small industries is derived from their backward and forward production linkages with other sectors of the domestic economy, especially with agriculture and large scale industry. Liedholm and Mead contend that, "while empirical evidence on the linkages with agriculture is sparse, it appears that these linkages are often important." Of particular note is the small farm equipment producer's capacity for "idiosyncratic design adaptation" to meet the equipment and tool needs of small farmers. Evidence of linkages with large scale industry is also limited and is discussed in terms of subcontracting arrangements between large and small firms. This is prevalent mainly in Asia, in certain product lines.

This second category receives amplification in another paper by Peter Kilby and Liedholm (November 1986). This has to do with backward and forward linkages and the capacity for idiosyncratic design adaptation. Farm equipment can play a unique role in the impact of agricultural inputs on productivity. Farm equipment inputs can act directly on the yield per acre and output per person. The rural farm equipment industry's capacity for idiosyncratic design adaptation is illustrated in the animal draft farming sector in Third World countries. Local blacksmiths may provide farmers with an additional array of cheap implements such as harrows for secondary tillage which result in higher labor productivity. Other examples are the portable irrigation pump based on vertical high-speed diesel engines made in small engineering workshops in India.

On the supply side, the key issue is whether or not small scale firms are efficient users of economic resources, compared with large scale firms. The authors review measures of labor intensity and capital productivity to ascertain economic efficiency. Aggregate data suggest that small scale industries generate more employment per unit of scarce capital than do large scale industries. Furthermore, on the basis of limited data, the overall output generated by small industry generally exceeds that of large industries. With regard to social benefit-cost analysis the authors' key finding is that, in most cases examined, the smaller firms achieved higher ratios than large scale firms in the same industry. They conclude that there is growing evidence to suggest that for a significant range of products, small scale industry is economically efficient.

Government and donor interventions.

Given these favorable characteristics of small scale industries and their potential contributions to growth and income, we are led to a consideration of what governments and donor agencies can do to promote the role of small scale producers. There are two approaches available: changes in the general policy environment which affect small private enterprises and specific project assistance.

- General policy environment.

There are two major ways that the general policy environment can be made more supportive of small scale enterprises. The first is through instituting "neutral" policies with respect to size of firm. In general most government policies in investment, trade, and credit are biased against the smaller firm. Investment incentive laws often restrict the special tax concessions to large firms. Also, small firms are frequently ignorant of the concessions available to them. Credit policies tend to discriminate against small private firms since governments impose artificially low interest rate ceilings and credit controls on the banking system. Consequently, banks respond by rationing scarce funds to their traditional large scale clients. Small firms are forced to obtain funds from family or the "informal" market, moneylenders who often charge rates over 100 percent a year.

The second major approach is through enhancing demand for the products of small scale enterprises. Studies have indicated that one of the key constraints facing small firms in the rural areas is the limited demand for their products. A large portion of the low-cost consumer goods sold in rural markets is produced by local small firms. The demand for these products and for agricultural inputs is high among small scale farming households. Hence, policies that promote increases in agricultural income provide a stimulus for small firms. In sum, there is a wide range of policies - including agricultural, trade, and foreign exchange - that affect rural small scale production.

- Project assistance.

The primary vehicles used by governments and donor agencies to promote small enterprise development have been project assistance rather than policy reforms. It must be noted that small firms are difficult targets for assistance. They are numerous, widely dispersed, and not easy to assist in a cost-effective manner. According to many surveys, only a tiny fraction of small firms have ever heard of the programs intended to reach them. The most commonly used form of direct assistance to small industries has been special credit programs. Administrative costs for this type of assistance have typically been very high.

Liedholm and Mead summarize the features of the more successful attempts at credit assistance. First, loans are provided mainly for working capital rather than fixed capital. Secondly, loans are screened in locally-based institutions on the basis of the borrower's character. Thirdly, the loans are initially made for small amounts and short periods to encourage high repayment rates. These are practices similar to those of the informal credit institutions. Non-financial direct assistance to small enterprises include the delivery of technical, managerial, and marketing inputs. Several of the private voluntary organizations have made this the focus of their support for small enterprises.

Indigenous strategies for providing credit assistance bear particular attention. Jason Brown has surveyed small scale lending in developing countries and presented his findings in a paper for AID's Office of Rural and Institutional Development, (April 1984). Brown observes that many developing country banking institutions have initiated programs to provide small-scale loans to small firms. As with other aspects of small enterprise development, data on the scale and effectiveness of these loans is sparse. Brown developed nine case studies (including one in Africa) in an effort to draw comparative conclusions. Most lending at this level by banking institutions is of recent origin, though a few pre-date 1970. For example, Syndicate and Canara banks in India have been active for many years. But in general, banks and other formal lending insitutions have been slow to respond to the credit needs of small business. Perhaps the major reason is the difficulty in identifying and handling a large number of small accounts at an acceptable cost.

There are many rationales for establishing these programs, ranging from purely political to profit maximizing, and often a combination of these. Government policy frameworks have had a significant impact on most of these programs. In India, government policy has been reponsible for making bank programs for small enterprise the largest in the world. The initial impetus was primarily political. The government nationalized its banks in 1969 and forced them to lend to greater numbers of small borrowers. In Indonesia the government began experimenting with small-scale lending in the 1970s. In Bangladesh, the banks began to provide small business lending due to the availability of various incentives developed through a loan from AID.

Brown concludes from his survey that there is considerable interest among banks in the greater use of intermediaries such as non-profit organizations and money lenders to distribute credit. He observes that the successful use of non-profit intermediaries has occurred when the organizations were fairly large and well-organized. While many economists argue that the only way to reach large numbers of small borrowers efficiently is through commercial banks with unsubsidized credit, Brown suggests that successful government programs such as the BKK in Indnesia and the Dominican Republic offer evidence to the contrary. The main problem with commercial banks is in getting them to start lending in this sector. To do so initially, a subsidy may make sense. Brown concludes that lending at this level in developing countries is in fact growing. Banks are beginning to overcome their fears and are finding new ways to make such loans at acceptable costs.

In another paper prepared under the EEPA contract, professors Liedholm, Mead, and Steve Haggblade review the effect of policy and policy reforms on non-agricultural enterprises and employment (March 1986). They note that much policy reform has been focused on issues of leverage and conditionality. While this approach has met with some success in cases of stabilization policies, there is less evidence to indicate successful leveraging aimed at developmental policies concerned with enterprise or employment. They argue that the most important contribution that donors can make to policy formulation is assistance in building up indigenous capacities for policy analysis.

3. Identification of actors in the African private sector

In addressing the previous issue regarding strategies for private sector development, we relied to a large extent on the work of economists. Yet this literature does not help us understand the social and cultural attributes of those who pursue low resource agriculture in Africa. The economic literature treats the subject of development as though people everywhere respond to market mechanisms in the same fashion. We have attempted to suggest that donor agencies can also gain insight into how the informal sector operates from a reading of the ethnographic literature. A phenomenological perspective might help to see the issue as seen by the poor themselves.

Poverty as viewed by those in low resource agricultural areas has to do with subsistence security. Those who are viewed as being well-off are those who regularly meet subsistence needs and actually have a surplus. The average consumer is one who scrapes through without much surplus. The very poor are those whose production may meet basic needs for six to nine months of the year, but who also may experience situations of chronic malnourishment. A moving recent portrait of this condition and its social creation, based on extensive field work, is that of Mesfin Wolde Mariam's Rural Vulnerability to Famine in Ethiopia, 1958-1977, (1986).

The definitions of relative poverty of course vary in the African region depending upon local contexts. The general decline and stagnation in much of rural Africa in recent years has been chronicled in International Labor Organization (ILO) surveys and elsewhere. The primary issue is not so much what outside actors are doing to support the rural poor. Rather it has to do with the relations between the rural poor and other social classes and institutions. Can any of those relations be developmental? It is important to distinguish development from growth. We need to insist upon a process that includes growth but also increases spread/equity, institutional effectiveness, and sustainability.

Low resource agriculturalists buy and sell among themselves, and with small rural traders and moneylenders. They also trade with average and more well to do households, including selling their own labor. There is a substantial literature on the other actors in the larger arena, on the role of culture, law, and political economy in maintaining local stratification. The limits of trickle down policies and other aspects of rural growth policies are examined in a volume edited by Heyer (1981), among the best collections on contemporary rural Africa. Gran maps out the range of material available in this area in a forthcoming bibliographic volume.

The Michigan State University research reviewed above leads to policy prescriptions to lessen the investment and credit bias against small scale industry. Improving demand for small scale production is also prescribed, as are expanded small credit schemes. While it is difficult to take issue with these proposals, an understanding of how the rural poor perceive these prescriptions could be better informed by local level research into the culture, social structure, politics, and history. Among the important questions that need to be addressed is the extent to which a culture sanctions the lone entrepreneur versus group approaches to entrepreneurial endeavors. Several studies of small scale industries suggest, for example, that loans to groups of individuals can enhance the likelihood of high repayment rates. Based on this premise the Trickle Up Program, a New York-based private voluntary organization, requires the participation of groups of five individuals for approval of 50 dollar loans.

A complement to a reading of the economic literature should include the work of Polly Hill, whose latest work is entitled Development Economics on Trial (Cambridge, 1986). Much of the best work on rural marketing, such as that of Barbara Harris and Jan Breman, is in Asian studies. Interdisciplinary studies on rural markets in Africa are to be found in several unpublished PhD dissertations in English. Often overlooked by American scholars is a substantial body of research published in French, much of it produced by the French research institute, ORSTOM. A good example is the work of Gastellu (1981). The historical factors that have conditioned the private sector are examined in a massive two volume work edited by Catherine Coquery-Vidrovitch entitled Entreprises et Entrepreneurs en Afrique - XIXè et XXè siècles, (Harmattan, 1983).

A very useful exercise would involve comparative case studies that draw upon examples in various regions of the world. Abdou Toure, in his book entitled Les petits métiers à Abidjan (Kartala, 1985), provides insightful profiles of small businesses in the Ivory Coast which illustrate the struggling underside of an economy dominated by elephantine state-owned and foreign enterprises. The Proshika program in Bangladesh provides evidence that the assetless poor can use small credit loans productively by a carefully orchestrated group process of collective responsibility. Reports on Proshika are included in a 1984 IFAD evaluation by Dharan Ghai and by Swapna Mukhopadyay (editor) in Case Studies on Poverty Programmes in Asia, (1985).

The following is a brief summary of the available field evidence on low resource agriculture and private sector development from various international agencies:

- World Bank

The Bank's own recent internal papers claim very little success in efforts toward African rural development. Beginning in 1975, the Bank expanded loans for small and medium-sized enterprises. Heretofore, the amount of Bank lending to this sector had been miniscule compared with those provided to development finance corportations. As the Bank has become more involved in this sector, it has tended to become increasingly concerned about the policy context in which small enterprises operate. One notable example of a Bank funded project is the Cameroun Small Farmer Credit Fund. In his study of small scale bank lending, Jason Brown observes that it was owing to the pressure of the World Bank that the Banque Camerounaise de Developpement agreed to make small scale loans. He contends that the difficulty in meeting the objectives for yet smaller loans stems from the Banque's perception that such loans are not viable, even if the

World Bank continues to apply pressure to assure that they are made.

- International Labor Organization (ILO) and ILO/JASPA

The ILO has sought to bring about policy change through analyses conducted by high level outside consultants. Beginning in 1970, the ILO sent interdisciplinary teams to advise governments on strategies for employment promotion. Those missions included Kenya, the Sudan, and Egypt. One of their key features was the comprehensive nature of their approach to the analysis of the employment problem and of strategies to cope with it. Employment was seen as part of the overall problem of poverty and income generation, not merely the creation of jobs.

The employment missions made several recommendations regarding policies for the encouragement of non-agricultural employment and small/medium scale enterprise. Among these was a call for the removal of artificial ceilings on interest rates. The missions were also notable for their focus on the "informal" sector. They examined the link between income distribution and the pattern of rural non-farm employment and enterprise development. The missions recognized smaller enterprises as important sources of employment and explored the policy environment in which they operated. The Kenya mission report, for example, observed that the informal sector has been discriminated against because of several public policies. The report called for a review of trade and commercial licensing and the elimination of unnecessary licenses. It suggested intensifying technical research and development on products suitable for fabrication in the informal sector. It proposed inducements to larger firms to train and work with smaller subcontractors. And it called for an increase in government purchases from firms in the informal sector.

The unpublished ILO series WEP 10 and WEP 10-6 are essential reading for an understanding of African rural poverty. ILO publication catelogs are available for a complete listing of published reports. There is, for example, a reference volume on appropriate technology for rural women in West Africa.

- International Food and Agricultural Development (IFAD)

Most of the small farmer projects undertaken by IFAD have been co-financed by the World Bank and other agencies. IFAD's lack of resources and staff have left most projects vulnerable to cooptation, both by the World Bank (which often writes the project paper) and by local implementors. From a review of 1982-84 project papers and evaluations, our impression is that the small farmer who is the target of IFAD projects is often not among the poorest, the typical low resource agricultural household.

- Agency for International Development (AID)

There is an extensive array of literature generated by AID staff and contractors that has been generated on the private sector and rural development since the famine in the Sahel in the 1970s. Few projects to date, however, have been designed with the appropriate quality and depth of local household research. Typically, AID-funded research is conducted by expatriate teams, written up in English, and occasionally not even distributed to appropriate users within host country ministries and institutions. There is a need for more participatory policy research involving local scholars, such as ILO/WEP and UNRISD have pioneered in. This point receives amplification in the Haggblade, Liedholm, and Mead paper on policy reforms (1986). They cite examples of AID-funded research involving collaboration between U.S. and host country institutions. For example, Kasetsart University in Thailand conducted research on rural off-farm employment. It was subsequently drawn upon in the Thai development plan which placed emphasis on rural employment through small scale enterprises. A similar analysis of small enterprise has been performed by the Rural Development Studies Bureau of the University of Zambia. The work of Robert Charlich on animation rurale (1985) is excellent for an understanding of the environment in which AID projects in West Africa operate.

- Private voluntary organizations

In general, PVOs have not been very good at documenting field results. Interaction, the American Council for Voluntary International Action, has contibuted to an understanding of the range of efforts being made by U.S.-based PVOs toward assisting low resource agriculture. The results of a survey of 150 PVOs is presented in a pamphlet entitled Diversity in Development: U.S. Voluntary Assistance to Africa (1985). It reports on 2,736 projects operating during the period from 1983 to 1985. Of these, only 112 (4 percent) were assistance to small industries in 34 countries. Many of these were concentrated in a few countries such as Kenya (18) and Ethiopia (11). As a project area, small enterprise assistance represents a relatively new emphasis among PVOs. By comparison, 636 projects (23 percent) were multi-purpose rural and urban community development projects, some of them including income generating components.

Other sources documenting field results include the ICA survey in three volumes (1985-87) from K.G. Sauer. French language studies such as Rouille d'Orfeuil (1984) and C. Joly (1985) also examine the efforts of private voluntary organizations. Many of the PVOs are moving toward projects aimed at long term development, as compared with the traditional role in disaster and famine relief. Most PVOs, both large and small, tend to subscribe to the small is beautiful school: they feel that the African communities they serve are best able to use relatively small infusions of capital or other major resources at one time. Their small scale, participatory approach is at least in principle tailored toward reaching low resource agriculturalists. Some, such as Oxfam, do a commendable job of reaching small groups through indigenous intermediate institutions. Others still do not address this critical matter and fail in attempts at sustainability, just as large projects implemented by government ministries often do.

From this summary of external actors involved in private sector development assistance and research, it may be said that modest efforts have been made by donor agencies and PVOs to reach the low resource agriculture sector. It is imperative that more research be undertaken on the factors - social and cultural as well as economic - that condition those efforts in rural Africa. A Congressional mandate to help the poor through private sector approaches faces substantial obstacles in the policy process, both in Washington and in Africa. Worldwide efforts for an alternative, more effective policy and practice do exist. The Office of Technology Assessment is to be commended for recognizing some of the elements in its August 1986 report. It will take many such educational efforts in Congress, aid agencies, and in universities to create the political will and institutional capability to reach low resource agriculturalists effectively.

4. A Modest Proposal for Future Policy Studies

There can be no further doubt that today we live in a global economy. Issues of international development assistance and trade are no longer just the concern of a handful of consultants and bureaucrats. Indeed, international trade has moved to the top of the legislative agenda, swept along by popular sentiment for protectionist measures. (A bumper sticker spotted on the beltway recently observed wryly: Unemployment: Made in Japan.) Most Americans now fully understand that other nations, even those in the developing world, have the capacity to affect their pocket book. We can no longer afford the luxury of assuming that whatever happens to poor people in developing countries has little bearing on our own lives.

This applies as well to those involved in the design and evaluation of development assistance programs. Scholars and policy makers have been accustomed to thinking in dichotomous terms of Western industrial countries and non-Western developing countries. The problems of the Third World are thought to constitute a separate unit of analysis and set of policy concerns. Our own society's problems of equity and development versus economic growth in this age of mergers and acquisitions are seen as being of an entirely different order from those in developing countries that have yet to embrace the free enterprise system.

Yet upon closer examination, it may be observed that the issues of scale and participation in the economic system of industrialized societies are not unlike those of the Third World. This applies to agricultural policy and the role of small business. The family farm in the United States is experiencing the most serious crisis since the Depression. The Small Business Administration is studying ways to open up small business opportunities in rural areas for farmers whose farms have been foreclosed. Granted, the farming population in the U.S. constitutes a very small portion of the total, compared with the high percentage in developing countries. But perhaps there are lessons to be learned from the American experience concerning the potential role of small business in the rural areas.

Only recently, in fact, have we begun to be aware of the importance of the role of small enterprise in the American economy. In 1979, Prof. David Birch published an article on the job generation process which has become something of a landmark for an appreciation of the role of small business. Birch noted that jobs were being created, not by the Fortune 500 or even 1500, but by smaller businesses with far fewer than the 500 employees that constitutes the official definition of small business in the U.S. Two-thirds of all new jobs created between 1969 and 1976 were in companies with fewer than 20 employees. In 1982-83, the Fortune 500 companies lost 310,000 jobs while the rest of the economy was creating 3 million. Students of developing country economies are now discovering that a similar phenomenon may be occuring in the "informal" sector in the Third World, where small business is usually defined as less than 50 employees. Are there any implications for policy makers here?

Issues affecting the operation of the small business community in the U.S. have been generally ignored by policy makers. Small business interests have heretofore been poorly articulated and thus have enjoyed relatively little political clout at the national level. Recently, however, at the White House Conference on Small Business held in Washington, nearly 2,000 delegates from every state in the Union debated issues that concern their businesses. The conference report includes a total of 60 resolutions voted upon by the delegates on issues ranging from economic policy, education and training, to technological innovation, regulations, and international trade.

Many of the delegate concerns are strikingly similar to those described in the literature on rural non-farm enterprises in the Third World. One of the stongest resolutions stated that government has failed to protect small business from damaging levels of unfair competition. It called for new laws to require government reliance on small business for performance of commercial functions. Delegates urged the federal government to increase its awards to small business to 35 percent of total contract dollars to correspond with the percentage contribution of small business to the GNP. They urged the federal government to promote entrepreneurial education and improve the dissemination of information regarding business opportunities. The delegates called for the development of new capital formation and retention vehicles. They endorsed the use of incentives to foster increased investment in small businesses, such as the Small Business Investment Incentive Act. They recommended that Congress ensure equal access to commercial credit for all small businesses, and that women and minorities are not discriminated against in granting commercial credit.

It is possible that lessons learned from the American experience may be applicable to Africa. For example, such technological innovations as the incubator movement in the U.S. might be appropriate for stimulating rural enterprises in Africa. Of particular relevance would be exploration of ways to involve small U.S. businesses in African rural enterprise, where there may be a complementarity of interests. Understanding of the generic features of small business and its role in the national economy should help to inform inquiry into appropriate approaches to the promotion of private sector development in rural Africa.

FINAL DRAFT

LOW-RESOURCE AGRICULTURE IN AFRICA

New Models for Low-Resource Agricultural Research and Extension in Sub-Saharan Africa

by

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FINAL DRAFT

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NEW MODELS FOR LOW-RESOURCE AGRICULTURAL RESEARCH AND EXTENSION IN SUB-SAHARAN AFRICA

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A. INTRODUCTION

A 1. *Agricultural R&D for resource-poor farmers: present dilemmas and new options*

The majority of African food producers fall into the resource-poor category. They are poor because of unproductive land and unpredictable environmental conditions, and because of gender inequalities (women predominate in production of food crops in sub-Saharan Africa). The case for focusing greater R&D investment on resource-poor food producers is based on a) the size (and intrinsic importance) of this constituency, b) untapped potential for endogenous solutions to the African food crisis, c) the urgent need to sustain and increase food-crop output given rapid rates of population increase, and d) humanitarian concern to eliminate mass starvation.

Agricultural development initiatives in Africa in the last 15-20 years or so have been based on top-down transfer of technology (henceforth TOT). The weaknesses of the TOT approach as far as the resource-poor constituency is concerned, include:

- a dearth of appropriate and farm-tested inputs for low-quality variable upland environments (where the majority of resource-poor farmers live). High yielding varieties (henceforth HYVs) often perform badly under realistic local conditions of labour supply, risk etc.
- lack of access by resource-poor farmers to TOT innovations (in

cases where these are effective) because, for example, women or tenant farmers (cf. Dey 1981, Rogers 1980) cannot qualify for essential credit, or because supplies of improved inputs are monopolised by wealthier and more influential farmers.

- the expense and inefficiency of the bureaucratic structures (e.g. Integrated Agricultural Development Projects [henceforth IADPs]) needed to deliver TOT input packages. These problems tend to be at a maximum in regions of greatest poverty (Karimu 1980).

The TOT approach to tropical agricultural development draws much of its inspiration from the way in which HYVs transformed productivities in temperate zone agriculture (especially food production in the US Midwest) during the 1920s and '30s. The approach was successfully transferred to parts of Asia and Latin America in the 1950s and '60s (the so-called Green Revolution [henceforth GR]). More recent experience, however, suggests that the old-style GR approach - a simple technology package centered on one or more HYVs - is not well adapted to more marginal environments in Asia and to large parts of Africa, due to fundamental ecological constraints (Biggs 1986, Eklund 1986, Greenland 1984, Matlon 1983, Moris 1983, Richards 1985).

Resource-poor farmers are those with the least opportunity to create the controlled conditions (e.g. irrigation) for which TOT packages and standardized extension recommendations are intended. The point is well put by two extension practitioners associated with a northern Nigerian IADP:

> Farmers' decisions on crop combinations, and spacing and timing of operations depend on how the rainy season unfolds. The amount and distribution of rainfall varies not only from year to year and from north to south but within very small areas. Any system that relies upon sequences of pre-planned technical messages passed on by cyclical farm visits is clearly too inflexible (China & Langmead, 1985).

Dealing with difficulties of this sort requires a different kind of R&D, with much greater emphasis than hitherto on ecological specificity (Conway 1985, Eklund 1986, Richards 1985). The focus of the present paper is on the extent to which implementation of a participatory research model (henceforth PR) might meet these new requirements.

Participation (in rural development) has been defined as 'a process in which a group or groups exercise initiative in taking action, stimulated by their own thinking and decision-making, and over which they have specific controls'. In an R&D context the PR model requires conscious inversion of several conventional R&D attitudes. PR aims to be client-focused and demand-driven. It involves clients' own skills and energies wherever possible, both in formulating research problems and methods of attack, and in the actual research itself.

PR explores many professional and institutional "reversals" (Chambers 1983, 1985, Chambers & Ghildyal 1985). The following ideas are central to PR philosophy:

- clients and experts work in partnership, and great attention is paid to the institutional context in which such partnerships are forged and flourish. PR is concerned to see research problems through clients' eyes.

- experts seek to deploy their talents in consultant not controlling positions. Attempts are made to seek client mandates for research programs and to involve clients in evaluation activities.

- orthodox concentration of scientific resources in "centers of excellence" is balanced by a concern to take up any rasonable opportunities for decentralization in research activities (e.g. emphasis on a wide spread of on-farm trials, adequate provision for staff mobility, funding for research networks to support scientists in remote locations).

- conventional status distinctions between pure and applied, or high-level and "adaptive", research are questioned. For example, PR offers a challenge to the assumption that "adaptive" research is of only "parochial" significance. Work on the basic ecological principles underlying adaptation of agricultural technologies to fit local circumstances demands and should attract scientific skills and insights of the highest order.

- whenever possible, researchers are encouraged to undertake at least some of their experimentation while living and working under village conditions, and to treat these conditions as a challenge not a constraint to scientific enquiry. PR changes expectations as to what constitutes an "interesting" result: e.g. it may be more important to know that goats can destroy the protective barbed wire around an on-farm trial than to achieve a conventionally "successful" result (measured by yield)! PR, it should be added, also has profound implications for what "peer reviewers" and editors of scientific journals consider significant work.

- PR staff are recruited for their interest in and skill at running off-station activities (e.g. competetence at participant observation, communicating with farmers and running on-farm trials). These are high profile activities and commensurately rewarded. If "junior staff" do these activities better than "scientists", PR is quite open to the idea that some degree of professional regrading in agricultural research institutes might be called for.

- special attention is paid, under PR, to the possibility of capitalizing on hitherto neglected system complementarities and "incremental" gains in productivity from careful ecosystem management, either as alternatives or supplements to single factor or "big-fix" solutions.

In some ways the most important reversal of all is the recognition basic to PR that clients are in many instances also experts. In particular they are experts in the nature of the problem. This expertise is a potentially productive but underutilized resource (Chambers 1980, Chambers & Howes 1979). The poor may be poor in material resources (land and capital) but rich in mental resources (ingenuity and invention). It is through such mental resources that they have been able to survive, adapt, and even innovate in harsh environmental conditions. PR aims to mobilize, support and strengthen these skills.

The aims and objectives of PR programs for resource-poor farmers in African agriculture are subject to detailed discussion later (Sections B 1 and C 2). It is appropriate at this point, however, to note two basic themes which recur throughout the later discussion.

i. PR programs take local practices seriously (Biggs & Clay 1981, Chambers & Ghildyal 1985, Rhoades *et al.* 1985) and therefore stress the value of careful study of existing farming systems. Apart from attempting to identify "good local practice" with potential for wider application (Devitt, 1986), this kind of work is the basic means through which researchers come to see potential R&D problems through farmers' eyes. Training and aptitude in this area should be seen as a minimum qualification for professional involvement in PR.

ii. PR emphasises the need for formal and informal mechanisms for client consultation and involvement in the definition of research agenda and formulation of research problems (Bradley, Raynaut &

Torrealba 1980, Byerlee & Collinson 1980, Gupta 1981, Mathur & Gupta 1984, Norman cited in Chambers & Jiggins 1985, Warren 1984, Whyte 1981). Such consultation has to to organised with a full understanding of how competing local interests affect farming practices. Thus specific attention has to be given to the R&D needs and requirements of tenants and women farmers as well as male land owners. PR is often particularly concerned to strengthen the ability of marginal or neglected groups to "pull down" (or "set up") appropriate R&D, in the face of competition from better-endowed farmers with different problems, opportunities, and priorities. Locating and servicing, or assisting in the creation of, organizations reflecting the interests of such groups is a major task for extension workers involved in PR.

A 2. *Recent literature on participatory agricultural development*

i. PR and agrarian populism

The development of PR is closely linked to the history of so-called "populist" strategies for agrarian change (Kofi 1980, Richards 1985, Watts 1983, Williams 1976). Such strategies had strong advocates in both Russia and the US in the earlier part of the 20th century, in a context where peasant family farms were a dominant element of the agricultural landscape in the two countries concerned (Kitching 1982, Hofstadter 1969). The stress paid by Soviet agricultural economist Chayanov and his collaborators in the 1920s to the way in which the life cycle of the farm household influences motivations and land management decisions is an early instance of the PR emphasis on the importance of trying to evaluate policy or research agenda through peasant eyes. The influence of populism in the US is especially evident in the Land Grant College movement and state agricultural extension services, e.g. the specific attention given to means whereby farmers were able to shape R&D priorities and call on problem-solving services (Hildreth & Armbruster 1981). It should be borne in mind, however, that this degree of control over the R&D system stemmed from the fact that part of the funding for extension services came directly from the farming community, and that resource-poor African farmers have very limited scope for taking on similar responsibilities (Moris 1983), except in terms of assistance sometimes offered to resident "strangers" (e.g. villagers might encourage a popular primary school teacher or extension worker by assisting with land and labour for a small food-crop farm for subsistence purposes).

ii. Indigenous technical knowledge and 'informal R&D'

Recently, considerable attention has been paid by researchers to the documentation of the scope and effectiveness of indigenous technical knowledge (ITK). Case study material has been collated by Brokensha, Warren and Werner (1980) and Chambers & Howes (1979). Richards (1985) summarizes West African evidence. There are also valuable thematic surveys, e.g. Adams & Carter (1986), Scudder (1980) and Underhill (1984) on indigenous irrigation and Steiner (1982) on intercropping. Classic case studies include work by Allen (1967) on shifting cultivation, Hill (1963) on the adoption of cocoa in Ghana, Gray (1964) on indigenous irrigation in Tanzania, and Netting (1968) on intensive terrace agriculture in northern Nigeria. Recent case-study material includes work by Atteh (1980) and Uzozie (1979) on yam cultivation, Millington (1982) on soil erosion, Linares (1980) on wet-rice, and Johnny (1979) on upland rice. Dahl & Hjort (1979) and Toulmin (1983) demonstrate the richness of the ITK literature on pastoralism (cf. Sandford 1983, Simpson & Evangelou 1984).

It is important to note that the material on ITK covers inventions and recent discoveries by the rural poor, as well as the best of "traditional" knowledge. Especially noteworthy among recent work stressing the dynamism of indigenous agricultural practices is a paper by Netting (1985) which draws on a deeply-researched 20-year longitudinal study of the social and technical organization of agriculture in a savanna region of Nigeria. Netting's work is especially significant for the evidence it provides that indigenous invention is still a potent force for the promotion of rapid agricultural change in African food-crop farming systems untouched by formal development projects. When first studied in the 1960s Kofyar farmers were in the process of moving from intensively cultivated farms on the edge of the Jos Plateau to extensively cultivated farms in the Benue lowlands. More recently, in response to urban food demands under oil-boom conditions in Nigeria, these new areas of cultivation have been transformed from extensive to intensive cultivation, and in so doing the Kofyar have designed new farming systems only indirectly related to earlier intensive farming practices on the plateau edge. Netting stresses that these developments involve social as well as technical innovations, and the incorporation of "modern" inputs such as fertilizer and improved planting materials, but on farmers' own terms and according to their own technical judgement about how these inputs should be best used.

Biggs (1980a) and Biggs & Clay (1981) argue that the frequency with which peasant farmers develop interesting and effective innovations cannot be due to chance. They posit a systematic capacity to experiment which they term 'informal R&D', and argue that this capacity should be given explicit recognition, and encouragement, in agricultural planning. One way to view PR is to see it as, in essence, an attempt to forge complementarities between formal and informal R&D sectors. A pre-condition for this is a better understanding of the conceptual contexts within which farmer experimentation is likely to operate (Rhoades 1984, Richards 1986). What kinds of notions of causation and agency do different groups of resource-poor farmers bring to experimental work? One way to attack the question is to attempt to relate specific instances of indigenous experimentation (Johnny 1979, Johnny & Richards 1981, Budelman 1983) to debates about African systems of thought more generally (cf. Levi-Strauss 1966). In so doing, however, profoundly difficult and contentious questions are raised about the structure of African cosmologies and their social and political grounding (Packard 1982, Horton 1982, Hountondji 1982, Wiredu 1980). This important aspect of the PR program is only in its infancy and more research is urgently required (cf. Sharpe 1983, 1985).

iii. Ethnobotanical studies

Careful study of indigenous categories (terms and classificatory schemata farmers use to describe and differentiate soils, weeds, pests, crops varieties etc.) is an important prerequisite for effective participatory R&D. Colonial agricultural and forestry officers carried out important pioneering studies along these lines (e.g. Deighton 1957). There is currently a resurgence of interest in applied ethnobotanical study by specialists in African languages.

Furness (1986) for example has proposed a full-scale revision of Dalziel's *Hausa botanical dictionary* (1915) as a first step in implementing a computerised ethnobotanical data base designed to support PR in northern Nigeria. The work is designed to cue inputs from field-level agricultural workers and to provide them with a sophisticated resource for improving communication with farmers. Another linguist, Sengova (1986), proposes, if funding constraints can be overcome, an introductory course in principles of orthography designed to improve the capacity of field-level extension workers in Sierra Leone to accurately transcribe farmers' terms for local crop varieties, pests and weeds, when reporting such problems to R&D agencies.

iv. PR methodologies

Much attention under the PR rubric has been devoted to specific methodologies for greater involvement of resource-poor farmers in the research process. These methods divide into two groups: diagnostic and action-research applications. Diagnostic applications include various kinds of problem-reporting and "feedback" studies to identify farmers' problems and involve specific client groups in the formulation of research agenda (Barker *et al.* 1977, Byerlee & Collinson 1980, Richards 1985 [Appendix], Roling 1979, 1982, 1985). One diagnostic application of PR has been termed by Rhoades & Booth (1982) the "farmer-back-to-farmer" research model, in which farmers are involved both in the initial definition of the problem and in the subsequent field testing and evaluation of any answers proposed by specialist researchers.

Where research agenda have been settled PR "action research" attempts to involve the client group directly in the development of new technologies or the search for answers to key problems. Action research varies from, at its most basic, farmer assistance in an on-farm trials program designed and implemented by professional researchers, to full participatory programs in which farmers make important inputs to the design, execution and evaluation of the research programme (Abedin & Chowdury 1985, Agrawal & Saxena 1985, Ashby 1985, Attah-Krah & Francis 1986, Budelman 1983, Ngambeki & Wilson 1983, Sutherland 1986).

A more detailed discussion of the character and scope of both diagnostic and action research methodologies is undertaken in Section B 1, below. Meanwhile, this is an appropriate point at which to add a brief comment on the complementarity and overlap between PR and two "adjacent" methodologies for reaching and understanding resource-poor farmers, i.e. Farming Systems Research and the Training & Visit Extension methodology. FSR and PR have several interests in common (cf. Byerlee *et al.* 1982, Chambers & Ghildyal 1985, Heinemann & Biggs 1983, Maxwell 1984). The basic point of FSR - stress on the systemic nature of agricultural problems - reflects dissatisfaction with single-factor approaches characteristic of much TOT R&D in the past. Within FSR there are strong advocates of PR-type strategies, e.g. those who emphasise the importance of "participant observation" in fieldwork (Rhoades *et al.* 1985) or stress the interdisciplinary workshop approach to problem definition (Conway 1985). Some of this work is intended, or can be readily adapted, to incorporate direct farmer inputs.

Training & Visit extension methods, widely adopted by the World Bank have been often criticised for a top-down TOT bias. It should be noted, therefore, that the system was originally intended to encourage farmer feedback of the kind emphasised in PR, even if in practice this potential has been little exploited (Howell 1982a, 1982b, 1983, 1984).

v. Appropriate institutions

For PR to succeed resource-poor farmers need "appropriate" institutions, as forums through which problems and priorities can be debated, farmers and research agencies brought together, and R&D activities co-ordinated. In some cases it may be possible for outside agencies to take the organizational initiative (Whyte 1981) or for existing agencies to be appropriately restructured for the task. Moris (1983), for example, having discussed some of the institutional obstacles hampering effective agricultural extension in Africa, is able to suggest a number of modest but realistic reforms designed to induce greater "user-friendliness" in existing extension services. In other cases, institutions intended to provide the poor with greater access to policy and decision making processes in formal-sector research institutions will have to be built "from scratch", through local initiatives (cf. Adams 1980, Conchelos & Kassam 1981, Freire 1978, Hall 1981, Jiggins 1983, Kruks 1983, Swantz 1985).

Some recent literature assesses the potential of existing village-level institutions as frameworks for development initiatives of the PR type (cf. Painter 1986, Warren 1986). In other cases attention has focused not on "institutions" in the narrow sense, but on attempts to add a PR dimension to institutionalised events (e.g. ritual occasions, festivals and markets) over which resource-poor groups already have a measure of control (e.g. attempts to involve womens' secret societies in Sierra Leone in health care delivery, MacCormack 1982). Case studies in Colletta & Kidd (1981) and Etherton (1982) suggest that PR might sometimes usefully draw upon the resources of a range of "folk-media" (dance, drama, folk-tales etc.). Other literature is cautious about attempting to work solely or largely through "traditional" structures (Mabogunje 1980, 1981, Hyden, 1983). A balanced approach requires careful attention to a range of questions concerning circumstances under which it is feasible for poor people to co-operate on issues relating to the management of natural resources and common property (Gupta 1984a, 1984b, 1985a, 1985b, cf. Cline-Cole 1986, Wisner 1983).

Some commentators link organizational initiatives at the local level to a wider analysis of the recent poor performance of African state bureaucratic institutions. Recent tendencies to "write off" the state as an agency for development may have gone too far (Evans *et al.*). Schaffer & Lamb (1980) and studies in Clay & Schaffer (1985) suggest that there is more "room for manoeuvre" than is commonly realised. But in order to gain such room, political and professional conflicts of interest must be taken into account. New directions for agricultural R&D requires political as well as organizational skills (cf. Anderson *et al.* 1982, Biggs 1981, 1984, Biggs & Clay 1982, Biggs & Grosvenor-Alsop 1984, Leftwich 1983).

B. THE POTENTIAL ROLE OF PARTICIPATORY RESEARCH

B 1. *Participatory research paradigms*

PR is not so much a "model" as a problem-solving approach to the generation of agricultural innovations (Biggs 1985). Some of the main characteristics of this approach, distinguished by Biggs (1985) from what he terms "technology looking for a problem", are summarized in Table 1. Within the overall framework a range of methodological orientations are possible. It is convenient to conceptualise these as lying along an axis ranging from diagnostic to action-research applications.

1. Diagnostic applications

Two kinds of diagnostic application can be distinguished: rapid rural appraisal (RRA) and "deep diagnosis" based on intensive, and sometimes long-term, fieldwork.

a. RRA applications.

PR is, in this respect, similar to "market research" (in its stress on attempting to formulate precisely the needs, problems and priorities of specific client groups, in this case resource-poor farmers, as a way of influencing the formulation of R&D programs or the recommendations to which they lead). Appropriate methodologies include diagnostic survey procedures used by Byerlee & Collinson (1980) and Eklund (1986) in east and central Africa, and farmer panels to formulate agenda and test innovations (Norman cited in Chambers & Jiggins 1985).

The following brief example serves to illustrate the approach. Barker et al (1977) describe an RRA survey undertaken as part of a major investigation of the ecology and biology of the Variegated Grasshopper in Nigeria. The survey usefully supplemented laboratory analysis and field monitoring with information from farmers on the dates and comparative severity of previous outbreaks in different parts of the country and assessments of frequency of damage to minor crops. Farmers' own theories about periodic explosive increases in population numbers (e.g. rainfall fluctuations and the spread of certain kinds of weeds) were canvassed. This material made it clear that farmers already knew a great deal about the breeding habits and life cycle of the insect, and that the control strategy ultimately recommended by the project team - marking out and digging over egg-laying sites when rainfall patterns indicated potential trouble - had already been anticipated in one or two cases, thus strengthening the conclusion of the research team that a locally-based, low-cost self-help approach to control was a feasible alternative to high-technology control strategies envisaged at the outset. It was also discovered that in some areas pest control was a contentious issue between market-oriented male farmers (who were anxious to limit damage to cassava) and impoverished women and children (for whom the grasshopper was a useful item of supplementary diet). (A diagnostic survey, it should be added, only reveals such conflicts of interest: it does not show how to solve them.)

Diagnostic surveys have been used in a broader PR framework in work with small-scale farmers in Honduras and Guatamala (Whyte 1981). RRA approaches were important sources of information for scientists about local R&D priorities. The technique eventually evolved was to cover a target area with survey teams comprising agronomists and social scientists working in pairs, visiting villages and farms and interviewing farmers over a two week period. This equipped scientists with an adequate picture of local problems and potentialities, and was preferred, because of the speed with which results becme available, to more convention FSR and socio-economc surveys which might take a year or more to complete. Gupta (pers comm.) has been involved in similar work with research scientists and extension staff in the Bangla Desh Institute of Agricultural research (cf. BARI/OFRD 1986).

b. "Deep diagnosis"

Legitimate doubts may be raised about the representativeness of data and the accuracy of the diagnoses resulting from RRA surveys. Who gets to speak? The points of view of women and young people may go unreported or unnoticed where researchers rely upon "panel" discussions dominated by male "elders" (the norm for any kind of public meeting with "strangers" in many African societies). Not all relevant agricultural problems can easily be put into words. Some have to be "lived through" in order to be understood fully (e.g. labour bottlenecks and other seasonality problems).

There is no doubt about the practical attractions of RRA methodologies for formal-sector agricultural researchers anxious to get on with an active program of experiments and trials. It is often remarked in science, however, that good research, and durable answers, depend on good questions. Because of the complexity and fragility of the environments within which low-resource agriculture in Africa has to operate some key questions only begin to unfold with "deep" participatory research. Thus some PR proponents stress the especial significance of detailed studies based on a wholehearted application of participant observation methods. The classics of the genre (Allen 1967, Bohannan 1954, Hill 1972, Netting 1968, various volumes of the French series *Atlas of agrarian structures in Africa South of the Sahara*, and two studies dealing specifically with women cultivators, Kaberry 1952 and A. Richards 1939) have had a disproportionately beneficial impact on present perceptions of low-resource agriculture in Africa. But the range of case studies is still very small (in relation to the diversity of African food production systems) and longitudinal "re-surveys" (cf. Netting 1985) are urgently needed.

In my own view really effective PR will require more not less "deep diagnosis". The example discussed in detail below (Section B 2) is intended to counter the misunderstanding which this type of work has sometimes generated in R&D agencies and in the minds of their advisers (cf. Simmonds 1985). Before turning to this example, however, it is appropriate to round out this review of PR methodologies by a comment on action-research applications.

ii. Action-research applications.

Since the PR approach is still in its infancy it is understandable that there is as yet relatively little experience of action-research applications. Even so, a number of interesting experiments are on record. Two types of application have been attempted. The first is in effect the final stage of the "farmer-back-to-farmer" scenario, in which innovations and recommendations arising from a research program based on a client-focused diagnosis are taken back to the field for "on-farm testing", by clients. The method was found useful in developing a diffused-light potato storage system at CIP in Peru

(Rhoades *et al.* 1985).

A second (even more ambitious) scenario allows for direct involvement of local participants in the research itself (Ashby 1985, Budelman 1983, Kruks 1983). The arguments for doing this are fourfold:

- the farm is a more appropriate experimental setting for some kinds of projects than protected, atypical research station sites
- farmers have useful insights and materials to contribute to the design of experiments
- farmers learn from participating in experiments, or observing them at close hand, and there is an immediate extension pay-off where interesting or successful results are achieved
- farmers may manage experiments more cost effectively than research-station field staff (and in many cases, according to Budelman 1983, with as much skill).

An important paper by Ashby (1985) compares three methodologies for farmer participatory action research in a specific research context (a program to determine the potential of Colombian phosphate rock under farmers' conditions). Asking farmers for their own ideas about appropriate treatments led to 'significant changes in the design of on-farm trials'. She concludes that 'farmer participation in experimental design requires fewer resources and less time than does diagnostic survey research while qualitatively improving communication between scientists and farmers'. A second paper is promised in which 'findings on the effects of different types of farmer participation on trial management, on trial results, and on the evaluation of results by researchers and farmers' will be presented.

B 2. *PR diagnosis: a West African case study*

The study in question (Richards 1986) was undertaken against a background of persistent but often unsuccessful attempts to interest resource-poor cultivators in Sierra Leone in a package of wet-rice cultivation improvements (water control, improved varieties, fertilizer use) modelled on Asian experience. These wet-rice technology packages, and the integrated agricultural development projects set up to ensure their delivery and adoption, exemplify many of difficulties associated with the TOT strategy for agricultural development (Greenland 1984, Weatherhead 1984). A PR field program was designed to elucidate some of these problems and to derive alternative R&D agenda likely to yield innovations compatible with local efforts to improve the output of rice farming systems.

Fieldwork was undertaken in a typical medium-size village in central Sierra Leone, located about 30 km from Njala and at the foot of the major escarpment crossing Sierra Leone from northwest to southeast, during the 1983 farming season (January to November). The village comprises 98 resource-poor households primarily engaged in rice production. In order better to understand the constraints that might be operative upon agricultural professionals attempting to replicate this type of diagnostic PR I combined the fieldwork with a full-time academic teaching job at Njala University College and drew upon a minimum of logistical support. A research grant covered the expenses of running a motorbike, materials for a small number of fertiliser and variety trials and the wages of a research assistant. The research assistant was a secondary school leaver with agricultural training approximately equivalent to a typical extension field assistant.

The work involved participation in all village agricultural activities throughout a full farming season, with follow-up surveys designed to further illuminate key issues apparent from participant observation, and detailed discussions with farmers about indigenous experimental initiatives and farming system innovations. Attempts were made to distinguish various agricultural interest groups in the village and form a picture of their priorities for assistance from formal-sector R&D, taking as a starting point for discussion farmer-managed trials of fertiliser, improved varieties of upland rice (a men's crop) and swamp rice and groundnuts (mainly crops for women and young people).

In order to understand why existing technology packages failed to appeal to resource-poor farmers in this setting it was necessary to understand in detail how local land resources were utilised, and to comprehend the way in which a range of individual and social circumstances, health and climatic hazards, and accidents and misfortunes, affected farm management decisions. To secure subsistence requirements every individual (man, woman or child) has to participate in the making of an intercropped upland rice farm. Many such farms followed the soil catena in order to maximise the opportunity to plant some early rice on run-off plots and moisture retentive soils at the foot of the farm (often on river terraces). Early rice is an important hedge against seasonal hunger, the major cause of farmer indebtedness, and planting up the soil catena spreads labor burdens (shortage of labor is the major constraint on increased production). Once the household farm is secured individuals are free to use any spare time on private agricultural projects, e.g. married women work on upland intercrops and cultivate vegetables in swamps in the dry season, young dependent males and females plant floating rice in valley swamps, and groundnuts, maize and cassava are planted as "rotation" crops on the site of the previous year's upland rice farm by as many members of the household (older women especially) who can afford the time and incidental costs. The majority of the marketed agricultural surplus comes from projects of this sort.

The key point to appreciate is that the labor demand for work on water-controlled rice plots (the technology promoted by IADPs) conflicts with work on the household upland farm, but work on early rice, private plots of floating rice and groundnuts etc., and dry-season cultivation of swamps tends to complement rather than compete with household farm work. Once this point is grasped the general trajectory of local experimentation and farming system development becomes clear, and with it some ideas about the agenda of R&D issues likely to be appropriate to different resource-poor constitutencies.

Heads of household are keenly interested in solving constraints to early rice cultivation, for example by carefully selecting and conserving quick-ripening varieties suitable for run-off plots, or acquiring varieties resistant to high levels of bird damage experienced on early-ripening plots. Senior women in charge of the household farm are concerned to maintain upland intercrops, and are insistent that any switch to swamp cultivation would need to compensate them for the loss of such crops (especially cotton which they depend on for cloth manufacture during the dry season). A programme to introduce nitrogen-fixing tree crops into the upland intercropping pattern would need to gain the support of such women. Younger male and female dependents (from teenage onwards) are among those most interested in wet-rice cultivation, but cannot contemplate adopting labor-intensive water control procedures (because they lack time, and fail to qualify for IADP swamp development loans because of their dependent status). They need less intensive cultivation techniques based on floating and flood-tolerant rice varieties.

Already a number of innovations along these lines have been pioneered locally. The danger of increased erosion on early-season run-off plots is countered by stick bunding. Rotations of maize, cassava and groundnuts on land previously planted to upland rice, unknown 20 years ago, are now widely practised. Lower terraces and seasonally flooded valley lowlands are sometimes double-cropped by simultaneous planting of quick-ripening and dense-tillering long-duration varieties (the early variety is harvested before the flood rises leaving the long-duration variety to fill out the farm for the remainder of the year). But equally farmers want innovations and assistance from formal sector research. Heads of household are especially interested in improved rices suitable for run-off cultivation (quick-ripening awned rices resistant to bird damage, or which will yield a second, rattoon, crop without additional labor). Older women are interested in improved intercropping systems for for upland farms and more productive use of swamps during the dry-season. Household dependents (young men and women) are interested in higher-yielding floating rices suitable for non-intensive swamp cultivation. And clearly, local innovations such as stick bunds against erosion and double cropping on seasonally flooded land would be worth further investigation by formal sector R&D, perhaps as inputs into a programme of "sideways extension".

It is doubtful, for two reasons, whether any of these local approaches to agricultural intensification could be spotted, decoded and supported without in-depth participatory analysis of the kind just described. First, they lie outside the formal categories with which agricultural researchers are familiar. Local terms for the several varieties of run-off cultivation practised in the case-study village are not easily translated into English, nor do they fit any well-established soil science or agronomic category (but cf. Moorman & Breeman 1978). Conversely, the formal-sector distinction between swamp and upland, and the assumption that swamp cultivation could be substituted for upland cultivation (both basic to TOT strategies for improved rice farming systems in Sierra Leone) are misconceived because they obscure the fact that the distinction between upland and swamp cultivation also coincides with an important social distinction (between household and private farm). Failure to observe this distinction results in a development strategy which offers an intensive, monocropping, swamp rice package to the wrong people - the husband-and-wife partnership principally concerned to secure household subsistence, not those most enthusiastic for swamp development, namely household dependents.

PR in this context suggests, against the trend of rice R&D in Sierra Leone for the last 50 years, that what is now urgently needed is a program for low labour-input wet-rice cultivation in which innovations can be adopted by household dependents working on a part-time basis. This would mean, for example, switching attention from water control practices to floating rices (O'Reilly 1983) and improved methods of flood-advance agriculture, perhaps based on locally developed intra-specific double-cropping practices (cf. Clawson 194). Richards (1986) specifies in more detail the alternative agenda of R&D issues arising from this study. The logical next step is to check out, using RRA survey techniques, how general and widespread in Sierra Leone are the kinds of problems and priorities indentified through this case study, and then to attempt to mobilize funds and personnel for an action research phase.

B 3. *Advantages and disadvantages of PR*

What use is PR? What are its major drawbacks? This section is intended to provide a (necessarily rather bald) summary of the main advantages and drawbacks associated with PR models for development of low-resource agriculture. The chief advantages can be listed as follows:

- leads directly to identification of innovations and farming system improvements focused on specific interest groups and micro-ecologies. This represents a cost-effective means of reaching resource-poor target populations, with the prospect that innovations might spread spontaneously, or without requiring expensive "input package" delivery programmes.

- facilitates the tapping of new sources of increased productivity in tropical agriculture based on ecosystem management. The potential for such gains has been largely ignored until recently, due to concentration on HYVs. Conway (1985) concludes that the prospects for a new GR are dependent more on attention to micro-level ecosystem details than on major "single factor" breakthroughs characteristic of the old GR. This implies much greater attention to the stimulation of invention at farm level, and emphasis on a research role for *in situ* experts, namely farmers.

- supports and further stimulates informal and *in situ* adaptive research by resource-poor farming groups. The circumstances under which indigenous innovations flourish are not well understood. PR promises to increase such understanding with a view to encouraging the maintenance and further spread of "good local practice" and self-help adaptive research.

- strengthens R&D-related skills, networks and institutions at village level. In addition to enhancing prospects for self-sustaining agricultural change, recognition of the importance of local skills and institutions may also have profound and beneficial implications for local democracy.

- induces appropriate institutional development and reforms at research station level, with potential for better motivation and work satisfaction for extension workers due to client orientation (rather than orientation to a remote international peer group audience). This "inspirational" factor (especially if recognition of the importance of field-work skills in PR is accompanied by commensurate improvements in salary and status) may be of some significance in stemming the "brain drain" from African research and extension services.

- generates abundant feedback and monitoring data (e.g. on environmental problems and common property issues) that might otherwise require separate collection.

- is adaptable to a wide range of political conditions. PR draws inspiration from both left and right-wing variants of agrarian populism (Hofstadter 1969, Kitching 1982), and would not be out of place if in the aftermath of recession the political climate in Africa shifts decisively towards greater self-reliance.

Among the main disadvantages it is important to mention the following issues:

- PR would increase the gap between African agricultural research and some mainstream developments in temperate industrial countries, e.g. genetic engineering. (However this is to an extent counter-balanced by new or renewed interest in the lessons temperate country agriculture might yet learn from careful study of the agro-ecological principles underlying peasant farming practices in the tropics - intercropping being a notable case in point [Jackson & Bender 1980, Jackson, Berry & Colman 1985].)

- PR may prove to be awkward to accommodate within existing agricultural development bureaucracies, because it involves some redefinition of professional statuses and working patterns (e.g. much more time is spent on work at village level) and because the "egalitarian" rhetoric of PR (cf. Hall 1981) may be seen as a challenge to the "elite" orientation of some orthodox research institutions.

- the incremental approach implicit in PR offers the prospect mainly of slow and steady improvements in the circumstances of poor farmers. PR thus fails to meet political demands for "quick-fix" solutions. It should be stressed, however, that no other approaches (except for unrealistically expensive and technically inadvisable large-scale schemes) offer such prospects.

- PR may seem inappropriate to areas in deep ecological and economic crisis. This is a problem of political psychology not technological inappropriateness. It is difficult (in the aftermath of a major famine, for example) to persuade governments and administrators of the merits of adaptive approaches which take "traditional" agricultural techniques as their starting point, even though the evidence and common-sense may suggest that recent famine victims are in an even poorer position to make a success of radically new techniques or unfamiliar environments than they are to rebuild a modified version of that with which they are familiar.

B 4. *Compatability of PR with USAID proposals.*

The contract for the present paper specifically requests a comment on the extent to which PR proposals for African low-resource agriculture are likely to diverge from current proposals from USAID as stated in the agency's recent *Plan for supporting agricultural research and faculties of agriculture in Africa* (Agency for International Development 1985). The USAID plan accepts the necessity for a long-haul approach to the problems of resource-poor farmers in Africa. It continues to place major emphasis on the HYV approach but accepts that, pending results of breeding programs with lead times of at least fifteen years (for farmer-adapted innovation packages) there is merit in a piecemeal approach drawing on good local practice. This suggests some potential sympathy with the aims and objectives of PR, as a medium-term strategy (until the end of the century, say).

The authors of the USAID Plan and proponents of PR might well disagree over the long-term view, however. The plan is committed to the position that major increases in productivity of food-crop farming systems in Africa will in the end come in ways similar to the productivity gains over the last 50 years in temperate countries (through concentration on HYVs + chemicals + mechanization). Thus the plan continues to back the orthodox CGIAR approach (i.e. major funding support for crop improvement programs in international centers with FSR as back-up). This in turn explains the logic of the plan's proposal to concentrate R&D investments on only a handful of key

African countries and rely on the familiar step-down devices of TOT to achieve wider spread and local adaptation of available innovations.

This conflicts with the PR emphasis on *in situ* ecosystem manipulation as perhaps the major source of untapped productivity increase in resource-poor tropical farming environments and on the related idea that research problems relevant to the needs of resource-poor farmers may have to be built from the ground up. Without wishing to overstate what perhaps is only a difference in degree of emphasis, it does seem likely that from the perspective of the USAID plan PR might seem too complicated an option if its value is in the medium term alone (with reversion to top-down approaches after lead-times on HYV programs have elapsed). A crucial part of the argument, then, is a judgement about the relative importance of the agro-ecosystem perspective as a new paradigm for research world-wide, and the extent to which long-term gains in difficult tropical environments are more likely to be found through fine-grained system and management innovations (Conway 1985, Jackson & Bender 1980). Since this is a major unresolved research issue it might be prudent to consider support for the PR option, and a wider spread of local research, to a greater degree than the USAID plan implies.

C. POLICY AND PROGRAM IMPLICATIONS OF PR

The final part of this paper links PR to broader debates about agricultural development policy and points to areas where aid agency support for PR strategies might be expected to produce beneficial results. The discussion is divided into four main sections. The first considers PR in the context of recent debates concerning the political economy of African agriculture and the role of science in development. The second section discusses possible PR programs in an African context. A third section covers opportunities for aid agency assistance. A fourth section on costs is followed by a brief conclusion.

C 1. *PR and African agricultural development*

i. PR and the polical economy of African agriculture

In recent debates the central problem of declining per capita output of food in Africa has been seen mainly as an outcome of inappropriate development policies (e.g. urban-biased pricing strategies for agricultural produce, and unsuitable and badly executed rural development projects) in circumstances where a basic ecological fragility is further threatened by rising population pressure. Attempts to deal with these problems and dynamise the food-crop production sector have to be seen against a macro-economic scenario in which devaluation has sharply restricted the flow of even basic imports such as fuel oil and spare parts, and in which governments are constrained to make severe reductions in public sector activities, including education and agricultural support services. To this picture has to be added the likelihood of further reductions in development assistance from industrialized countries.

There is general agreement that asgricultural R&D still represents one of the best hopes for solving the fundamental difficulty of declining food output, and that this is likely to remain a public sector responsibility (Lipton 1985). The problem is how to increase the productivity of food-crop R&D, and how to take account of and respond efficiently to the great variety and rapidity of change to be found within African agricultural environments, in circumstances where public sector budgets are under such tight constraint. It should already be evident from earlier discussion that proponents of PR believe that their approach is tailor-made for these kinds of circumstances.

To recapitulate, PR aims to mobilise hitherto "fallow" intellectual resources and new sources of creativity from within the agricultural community, and to capitalise on the "spare" professional capacity created by the decline in state employment. Recruiting innovative farmers or herders to participate in experimental and extension programs as "para-professionals" (Bah 1985; Whyte 1981) is something PR proponents advocate for its value in increasing the client-orientation of R&D systems, and not simply as a cheap way of replacing professional skills for which the state can no longer afford to pay. Recognising the de facto part-time status of many state agricultural employees (Leonard 1984) is not just a formal device to balance the books in the face of public expenditure cuts, but an opportunity to encourage such persons to make greater use of their professional skills and contacts in localities (e.g. their home communities) where they have land rights and private farming interests.

In short, PR offers hope in depressing circumstances. The poor are inventive. They need to be to stay alive. Under recession conditions their creativity is relevant to a wider than usual constituency. PR offers an opportunity to bring the skills of the poor to the notice of this wider constituency and in return firmly to establish mutually beneficial links between hitherto neglected and marginalised outgroups and national formal-sector R&D capacities. At the same time it is possible to envisage ways in which PR might be useful, both in practical and inpsirational ways, in helping cope with the re-integration into private agriculture of employees made redundant by the contraction of state agricultural institutions, and as a stimulus to the imagination of a new generation of agriculture students facing up to the challenges of a more self-reliant, inward-looking, style of agricultural development.

Although Whyte (1981) rightly stresses that any implementation of a PR philosophy depends on the amount of attention paid to organizational issues, especially organization of peasant groups to sustain participatory initiatives, the degree of room for manouvre depends on the local political context, and the appropriateness of that program to that context. In Asia and Latin America PR is sometimes regarded with suspicion both by governments (fearful that peasant organization equates with violent challenges to state authority) and deeply entrenched agricultural bureaucracies (cf. Whyte 1981). In Africa the situation appears to be much more open, and there are several respects in which PR is especially well suited to the African social and political context.

Many African political systems are still organised around strong communal loyalties and networks of patronage and clientage linking local and national levels (cf. Foltz 1972, Cartwright 1978). Some commentators deprecate the survival of these "pre-modern" organizational characteristics, seeing patron-client relations as a potent stimulus to bureaucratic corruption, and communalism (often labelled "tribalism") as a chronic source of political instability and violent conflict. Other commentators, sensing that these characteristic may be less "transitory" than was once assumed, have begun to wonder whether they could be sorces of strength as well as weakness. A recent book on African famine by the political scientist Preston King (1986) openly advocates greater attention to localism and regionalism within a "confederal" setting as a possible means to liberate new energies for development in Africa's larger "multi-ethnic" states. In Nigeria, the severity of the present recession is stimulating a vigorous national debate about "self-reliance", in which attention is once more returning "communalism" as a political force for development, e.g. the model long advocated by Chief Awolowo, in which a strong and positive valuation is placed on "ethnic" identities (grounded in language and loyalty to place of birth) as a basis for "endogenous" development initiatives (a point of view put to me by several Nigerian colleagues who might prefer at this stage to remain anonymous). The durability of these communal loyalties in Nigeria, often transcending class and religious differences, continues to evoke surprise (cf. Laitan 1985), and the capacity of "town descendents unions" and the like to recoup resources from city-based elites and to achieve local development objectives is undeniably impressive. I shall suggest below that PR might be especially appropriate to this revitalised interest in community "self-help".

Overall, then, it is worth stressing that PR seems especially well-fitted to a continent in which self-reliance and an openness to innovation are strongly embedded within the cultural endowments and historical experiences of a number of African societies. Attention could be drawn to the history of successful peasant innovation and response to market stimuli (e.g. cocoa producers in Ghana at the turn of the century [Hill 1963], or most recently peasant food producers in Zimbabwe), and to the existence of indigenous concepts of technological experimentation or social change (Horton 1983, Richards 1986) to illustrate this point. African colleagues frequently stress that, to them, PR seems a useful way of rekindling a cultural self-confidence never entirely crushed by colonialism. Perhaps no more dramatic illustration of the point can be given than to cite work by Littlefield (1981) on the origins of US rice cultivation. In effect, the story of rice cultivation in the US - and therefore of present-day PL 480 rice exports to AFrica! - has its technological origins in the recruitment of slaves from the Upper Guinea coast purposely for a knowledge and skill of rice agriculture which European planters in the Carolinas at that stage did not themselves possess. The flow of technology transfer between rich and poor societies has never been solely a one-way traffic, and it is fundamental to the ethos of PR to give expression to this mutuality and to further extend its possibilities.

ii. R&D in development: "pure science" and "industrial" models

This section examines the case for shifting the conceptual framework within which African agricultural R&D operates from a "pure science" model to an "industrial" model, leading to the suggestion that client-oriented industrial R&D in the US might be a fruitful source of lessons and support for PR.

It is sometimes objected that PR is not "proper research" because it is not properly scientific. To this objection is sometimes added the rider that science has been a crucial element in the development of Western industrial society, and that less-developed countries should not be fobbed off with sub-standard science, especially in such a vital area as agriculture. I suspect part of the trouble here may be the way in which many people view progress in the natural sciences. Ernst Mayr (1981), in his magisterial history of the biological sciences, makes the point that it is common to assess scientific progress in terms of the discovery of new facts. Peer group pressure to assess progress in these terms is reinforced by public and political pressures. The conditions for the award of Nobel prizes are couched in terms of discoveries. New facts are easily reportable by the Press. But in reality, so Mayr argues, the major breakthroughs in biology have come not from the discovery of facts but from new concepts. Part of the difficulty in establishing FSR and PR approaches in the agricultural sciences is a tactical problem of establishing the case for a conceptual revolution in the way agricultural research is organised in a climate where professional and funding agency opinion is dominated by "discovery"-based assessment criteria.

One possible escape from this dilemma, suggested by Bell (pers. comm.) and Jiggins (pers. comm.), is consciously to downplay the "pure science" model (with its emphasis on research frontiers and "fundamental" discoveries) and reshape agricultural R&D directed to the needs of the poor according to an "industrial" model. In the industrial context much importance necessarily attaches to the role of R&D in sustaining and improving the efficiency of ongoing productive processes. In circumstances where the first requirement is to keep the plant rolling a practical inventiveness is fostered which sometimes appears lacking in tropical agricultural R&D initiatives.

An absence of day-to-day practical stimulus to realism in the "scientific" model of agricultural R&D is well illustrated by the long history of research into substitutes for shifting cultivation in the humid tropics. The arguments from first principles about the long-term instability of shifting agriculture were often sound enough, but for fear of appearing to give any kind of endorsement to what was seen as a fundamentally "outmoded" attitude to agriculture little if any work was done on ad hoc improvements to existing peasant farming systems. It is doubtful whether any industrial management would allow R&D staff to neglect efficient servicing of, and possible improvements to, existing production processes solely on the grounds that the plant was "antiquated" and "outmoded". Yet this was what mainly happened in the case of shifting cultivation. The pursuit of "perfect" systems (of crop rotation, mixed farming or green manuring) that would permit peasant cultivators to jump in one go from "outmoded" to "modern" cultivation practices (based on innovations often barely tested outside the research station environment) to the detriment of work on feasible piece-meal improvements based on the best existing practices was firmly censured over 40 years ago by the West Africa Commission report on the state of agricultural research in British West Africa. But such is the tenacity of the "pure science" model's pursuit of the best at the expense of the good that only now is the situation beginning to change, through for example social forestry and small livestock/alley intercropping programs which build on local initiatives to stabilise present cultivation systems and support gradual transition to more intensive and permanent cultivation.

Long delays in response to challenges of this sort are to be explained in part by the exacting methodological standards embodied in the "pure science" model; standards which are in effect unnecessarily exacting where the aim is a series of partial solutions appropriate to farming circumstances evolving quite rapidly under, for example, increased population pressure (cf. a useful discUssion by Maxwell [1984] of the problem of adapting FSR 'to hit a moving target'). The "industrial model" for R&D may be especially useful in this regard, with its emphasis on "technology development" as distinct from basic research.

> Technology development embodies a preference for trying out, for testing in reality over increasingly detailed specification of what the problems and opportunities might be. It is obviously more cost-effective, especially in the face of complexity, to try something out than to try to analyse everything in advance. Opportunities exist, if they exist at all, in the present, and the identifiable starting point is an immediate application within a specific (even if wide scale) context. Successful technological development in these circumstances is based on the frequency in time and location of tests in agricultural reality of numerous technologies, i.e. it is the overall number of technologies tested which counts and not the number of replications of any one technology...This is the way, in fact, that American industrial and commercial entrepreneurs operate... (Jiggins, pers. comm.)

She goes on to make the point that PR is 'essentially in the business of technology development' and that 'it needs to be backed up, rather than led, by a research capacity which takes its lead from the market-research-based, client orientation of technology development'. If this is correct it suggests that industrial entrepreneurs are more likely to see the point in, and respond supportively to, PR initiatives than will agricultural researchers operating within the "pure science" model. This leads to a possible role for US assistance to African agriculture that is as surprising as it is intriguing; namely, that African agricultural researchers and directors of research institutions stand to gain as much from direct exposure to the client-oriented world of industrial R&D as from periods of study leave spent in academic institutes of agricultural research.

C 2. *PR Applications*

1. Introduction - new model or no model

Whyte (1981) begins his state-of-the-art review of PR by arguing that most tropical agricultural research has been carried out within one of two basic frameworks - the "vertical" model particularly associated with cash crops and plantations in the colonial period and the "horizontal" model, based on US experience and introduced via American aid programs in the immediate post-independence period. He suggests that the "horizontal" model was intended to generate two-way participatory interaction between farmers and researchers but that the execution was flawed, largely because insufficient attention was paid to feedback from farmers to researchers. He sees PR - and in this I would agree - as a means to realize and expand upon the potential implicit in the "horizontal" model. I am more doubtful about the historical accuracy, at least as far as tropical Africa is concerned, of his "vertical" model applied to colonial agricultural research. PR-type initiatives (ethnobotanical studies, careful investigation of indigenous soil and land-use classifications, employment of farmers as "para-professionals" in extension and experimental work) were important in a number of departments of agriculture in African territories from the 1930s onwards (Richards 1985).

This point is of more than historical significance, since to my mind one of the characteristics of PR is that it is quite consciously pluralistic, in attempting to unite the best features of a number of distinct, and sometimes competing, methodologies for the development of African agriculture. African scientists' and officials' experience of the merits and demerits of a range of such approaches is a valuable resource which, like the knowledge and skill of peasant farmers, PR seeks to mobilise for development purposes. After assessing the competing merits of a number of distinct models to explain the origins of African agriculture Harlan (1975) opted for what he termed a "no model" model. At several points in the following discussion of adjustments in R&D policies needed to accommodate PR I shall stress that PR overlaps, but is not necessarily in direct competition with, established research approaches such as FSR, and that as a 'new model for low-resource agricultural research and extension in Africa' PR is perhaps best thought of as a "no model" model.

Pluralistic, multi-disciplinary and eclectic in ethos, PR is perhaps best introduced in a piecemeal manner. The aim should be to add to or complement the best of existing agricultural R&D initiatives. Some suitable points of entry are discussed below. Once the potential and limitations of PR in an Africa context are more clearly established, however, there is a case for its eventual adoption on a more comprehensive basis. In either case the central aim would be to identify problems and issues to which resource-poor farmers assign high priority but which hitherto may have been ommitted from national R&D agenda, and to enlist and organise local participation in the search for solutions. Discussions of potential subjects for PR treatment and of possible obstacles to implementation are followed by a concluding comment on training requirements.

ii. Piece-meal applications

- Observation and conversation. PR starts with very simple things, like walking through farms in company with farmers, spending nights as well as days in villages, deliberately seeking out and talking to farmers of different types and background (female and male, young and old, poor and rich), and cultivating scientific curiosity about local rationales for both "normal" and "unexpected" agricultural practices. Researchers and extension agents working in collaboration with Professor Anil Gupta in Bangladesh have achieved some exciting results, in terms of an enlarged understanding of the problems and potentialities of resource-poor farming environments, through systematic application of "farm walking" and careful attention to observational and conversational skills (Gupta, pers. comm.). It should be stressed that the second skill is as important as the first, since farmers have many insights, e.g. important historical data relating to changes in vegetation or fallow intervals or frequency of pest attack, which otherwise might be inaccessible to science (Page & Richards 1977). (The Bangladesh work is part of an innovative program, implemented by the On-Farm Research Division of the Bangladesh Institute of Agricultural Research, which will doubtless attract much attention once its results are more widely disseminated, cf. BARI/OFRD 1986).

- Diagnostic and problem-reporting surveys. In some circumstances it would be appropriate to follow up leads provided by informal observation with formal surveys designed to diagnose more fully, or to assess the severity and priority to be attached to, problems observed in farmers' fields or raised in discussion with resource-poor farming groups. Some appropriate PR survey methods and instruments are exemplified in Byerlee & Collinson (1980), Richards (1985) and Whyte (1981). PR surveys of this sort appear to have been especially useful in research on tropical insect pests (Atteh 1984, Barker *et al.* 1977, Raymundo 1986). Pest scientists have been attracted to PR both because of recent interest in indigenous control strategies (as an input to work on ecological control strategies) and because pest problems in tropical agriculture tend to be highly variable in time and space. "Problem reporting" surveys are useful for keeping scientists in touch with rapidly changing priorities "on the ground" and have been used effectively by entomologists at the Malaysian Agricultural & Development Institute, for example (Heong pers. comm.). The Pesticide Perception Network (Tait pers. comm.) is a useful source for further information on work of this kind.

- PR workshops & innovation user panels. Where specific client groups have been targetted for assistance it is appropriate to consider the organization of PR workshops, similar to FSR workshops described by Conway (1985), say, but explicitly incorporating farmers at the analytical stage. Similarly, PR approaches are equally useful where innovations have already been introduced. One idea is that of the "user panel" to provide feed-back and mutual support for problems associated with adoption. Ay & Nweke (1984) describe a typical case in which adoption of a high-yielding cassava from IITA caused women a number of processing problems due to its high water content. This difficulty was not anticipated by breeders or extension staff due to their lack of familiarity with the small-scale processing methods employed by women. A user panel with adequate representation of women farmers and food processors would be a good way to pick up both on the problem and on the processing innovations which some women soon came up with to deal with it.

- Plant collection. Standard "good practice" in PR-oriented R&D programmes stresses the importance of basic ethno-ecological work, e.g. recording local names for plants, insects, soils etc., and establishment and maintenance of herbarium and observation collections. Mutual exchange of planting materials between farmers and extension workers is an important aspect of training programs for agriculture students at the Certificate Training Center, Njala University College, Sierra Leone (Conteh, pers. comm.). Experienced Third World agricultural researchers participating in a workshop on PR at the University of East Anglia (July 1986) suggested that one obvious "window of opportunity" for introducing conventionally-trained agriculturalists to PR perspectives would be to stress links with plant exploration. It is appropriate in this context to draw attention to the large range of "minor" but locally important crops which are otherwise unlikely to qualify for their share of R&D attention. The tropical leafy vegetables are a case in point. They are nutritionally very important items in the output of resource-poor farmers, but such a diversity of plants is involved that few if any are ever likely to qualify for the full IARC treatment. PR would seem to offer a more appropriate line of approach, supported by information and plant exchange services of the kind maintained by the Royal Botanical Gardens at Kew (for an interesting example see work by Njonga [1985] on ndole [*Vernonia* spp.] in Cameroon).

- Farmer trials and experiments. Collecting and testing local varieties can be the basis for successful "with-farmer" experimental programs. Budelman (1981, 1983), working on the Tana River irrigation scheme in Kenya, ran trials, with farmer participation, to compare fertilizer response of local and improved rice varieties, and found that local varieties out-performed improved varieties in typical on-farm conditions. He also records that farmers had 13 criteria for evaluating the performance of rice varieties in addition to yield (cf. Richards 1985, 1986) and that the trials program generated a great deal of local interest (the number of participating farners grew from one to 45 in just four seasons). Budelman's work is especially interesting because farmers were largely responsible for maintaining and monitoring trial plots. Statistical indices suggest that over 40 per cent of these trials were maintained to professional standards.

- Capitalizing on local skills and interests. It is a justified criticism of African agricultural development that innovations are often directed to inappropriate recipients. Thus, for example, wet-rice development programs in the Gambia targetted male heads of households, whereas historically women have been the main rice producers. Dey (1981) suggests that this is to be deplored not just on grounds of equity but because it ignores a rich reserve of skill and enthusiasm. Systematic work on local observational and experimental skills is important because it helps identify such reserves of talent more precisely. What do different groups know about and do with specific crops or environmental resources? How do different production interests and farming experiences nourish different knowledge bases? Owusu-Bempah (1986) reports a fascinating study on conservation of forest resources in Ghana. This study demonstrates that women are more conservation-minded, and have a greater knowledge of forest tree species and their properties, than men, and concludes that agro-forestry initiatives should be targetted accordingly. Studies by Cline-Cole (1986) on the perception of quality differences in firewood species in Sierra Leone and on local re-afforestation strategies around Kano (northern Nigeria) have similar practical implications for fine-tuning conservation strategies to local needs and interests.

iii. Programmatic applications of PR

The above discussion has identified a number of points at which PR perspectives might be injected into existing R&D programs or development initiatives. It is appropriate now to consider possibilities for more highly-organised applications of PR.

a. Technical programs.

Whyte (1981) has described in some detail the development and role of PR units in the work of national agricultural R&D agencies in Honduras and Guatamala. Both appear to have been successful in gaining the acceptance of peasants and professional agriculturalists, in helping to diagnose the needs and priorities of specific resource-poor farming constituencies, and in organising effective action research at farm level. Differing to some extent in the degree of emphasis given to technical rationality and social mobilization (due to differences in political "climate" in the two countries) these two cases would serve as instructive models for those interested in possible applications in Africa. Features of the central American experiments worth especial note are the skilful way in which a small group of dedicated PR enthusiasts was able to defuse potentially damaging institutional and professional rivalries and the decision to co-opt skilled peasant farmers as "para-professionals", a device (recalling similar initiatives in Sierra Leone in the 1920s) which seems to have been effective both in reducing costs and in inspiring peasant confidence.

The Bangladesh example (BARI/OFRD 1986) would be a third instance of a largely technical program pointing to possible similar applications in Africa. Among many interesting lessons of the Bangla Desh case it is interesting to note that PR brought about a heightened appreciation of the role and skill of intermediate and junior staff. It is noted in BARI/OFRD (1986) that 'at many sites Fieldmen and Field Assistants were far more perceptive than even many scientists colleagues in terms of documenting the problem of poor peasants and describing their decision making' and that 'it was suggested that we should treat them as colleagues in the process of research planning, implementation and review' and that 'their contribution [should be] acknowledge[d] appropriately'.

b. "social" programs

The work described by Whyte (1981) is firmly in a technical idiom. Some would argue, however, that the crisis in African agriculture requires a strategy in which social and technical measures are linked. One of the attractions of PR, from this point of view, is its educative as well as its instrumental impact. PR has the potential to generate enthusiasm for self-reliant rural development where earlier political visions have lost efficacy (cf. Kofi 1980). Mabogunje (1980) argues that any new vision of rural development has to be "populist", in the sense that it has to be worked out through debate which involves rural people and captures their imagination. But equally it has to be conceived on a national scale, because it is difficult to forge effective visions out of "pilot projects" and piece-meal tinkerings. Is it possible to conceive of a version of PR which would mobilize agricultural researchers and the rural poor in a comprehensive national program? The following three-phase "plan" explores one such set of possibilities.

The first task would be to build up a national picture of the range of problems and opportunities to which PR might be applied. In effect, this would require an inventory of technological trends in the resource-poor farming sector. To this end, a national agro-ecological survey might be designed and implemented, to complement (or replace?) orthodox sample censuses of agriculture. This survey would provide an opportunity to take full account of farming system diversity, take stock of good local practices and promising indigenous developments, identify and characterise major problem areas and assess scope for further development. It would also be an opportunity to identify reserves of technical (and political) skill and assess the institutional resources of resorce-poor farmers. In other words, it would be an attempt to identify who already can do what, the extent to which such groups and individuals are already organised, their priorities for and degree of interest in "outside" inputs, and the need for wider "supportive" frameworks.

This would be a substantial initial commitment (similar perhaps to a census, whose power to focus debate on a range of national development issues is often under-estimated) designed to mobilise support and interest over a wide front and focus attention on some of the key issues in "populist" and participatory approaches to development. This national inventory of indigenous agro-ecological skills, resources and problems might be organised through an existing institution, such as the survey or statistical division of the Ministry of Agriculture. It would aim for the maximum possible involvement of agricultural research professionals in its design and implementation. There would also be major stress on eliciting media discussion with representatives of farming community interests. Field surveys would be undertaken by students and extension workers, with an explicit in-service training intent, to help reshape perceptions and mobilise enthusiasm for the concept of self-reliant or "indigenous" agricultural development. The survey would aim specifically to encourage resource-poor interest groups to form or mobilise to ensure representation of relevant points of view.

The second phase would involve an attempt to formulate (within 12-24 months) a detailed program of relevant and feasible PR proposals following on from leads provided by the national survey. The main burden of this follow-up work would fall upon a small PR project co-ordination team. Their provisional portfolio of PR proposals would be prepared and ranked in such a way as to reflect a balance between urgency and intrinsic importance, potential and feasibility (bearing in mind what might be attainable from the point of view of agricultural research specialists), and equity considerations (e.g. the special claims of isolated regions or grossly under-privileged interest groups). In identifying and placing priorities upon potential

PR ventures the team would also be expected to balance substantive and exploratory work (allowing some scope in the latter case for long-term FSR based on participant observation methods of study) and to pursue a deliberate spread of methodological initiatives (i.e. proposals combining high-level scientific expertise and farmer inputs in different proportions). In the course of this work the group would aim to foster effective links between national research centers, monitoring & evaluation agencies, field extension workers and appropriate resource-poor constituencies. The team would also have to develop appropriate means for involving village groups in the basic work of identification and further refinement of possible projects, through, for example, village-level 'seminars' and practical workshops.

The PR portfolio stemming from this phase of the work would then be presented for international and national funds earmarked in the country concerned for R&D under the PR rubric. Outside bids would also be considered at this stage, to encourage other researchers and institutions to propose programmes which fulfil PR criteria (i.e. R&D agenda reflecting the interests and needs of the rural poor and showing clear evidence of popular participation in their formulation). Assessment of these various proposals might be undertaken by an existing national committee on agricultural research, suitably augmented by international representatives where outside funds or issues of inter-African collaboration were concerned. In other cases it might be more appropriate to bid directly to existing national and international funding agencies (assuming these agencies had been suitably sensitized to the need for work in the PR idiom).

The third phase, implementation, would have two aspects: execution of the R&D program through an appropriate combination of research station and village-based research activity, and development of an infrastructure of PR institutions to facilitate testing and evaluation of resulting innovations. Such institutions would also be important in building up the capacity of resource-poor groups to formulate their own items for further rounds of PR R&D initiatives. However, any attempt to adopt the "social" approach on a comprehensive scale in the near future would be hindered by skill shortages and lack of experience with the method. Thus it is not difficult to conclude that in the short term, and as far as aid collaboration is concerned, priority attention should be paid to piece-meal applications and relatively modest technical programs linked to established agricultural research and training institutions.

iv. A check-list of potential PR projects

The discussion of ways in which PR might be applied has already touched upon the question of research topics for which the approach seems especially well suited (e.g. work on minor but nutritionally significant crops such as leafy vegetables). The following list of further possible projects is intended to help consolidate the picture of what PR is most likely to do well.

- A program to build on indigenous wet-land management skills and initiatives (e.g. FSR directed at improved integration of upland and valley recessional cultivation) in order to provide alternatives to small-scale water-controlled irrigation (Harlan & Pasquereau 1969, Devitt 1986, Dubois *et al.* 1983, Stock 1977).

- Work to identify 'windows of opportunity' in female farming activities, e.g. non-labour-intensive innovations compatible with current activity patterns, such as dry-season cultivation of valley-bottoms for vegetables (cf. Dey 1981, Guyer 1980).

- Evaluation and sideways extension of best local practices in grain storage, sustainable fallow systems and soil management practices (cf. Devitt [1986] on grain storage in Malawi, Uzozie [1980] on nitrogen-fixing shrubs in eastern Nigeria, and Millington [1982] on use of stick bunds against soil erosion in Sierra Leone).

- On-farm/farmer managed trials and experiments to facilitate adaptation to fertiliser use and to work out best locally adjusted fertiliser treatments (cf. Ashby 1985, Budelman 1983).

- A farmer-back-to-farmer program to develop improved (more profitable, more sustainable, less variable) intercropping systems for resource-poor farmers, deriving from an initial emphasis on how different groups of farmers use planting materials already, and on a selection programme for HYVs based on maximising complementarities within typical suites of crops as planted by resource-poor farmers.

- A bid from a client group to bring in researcher to look at specific weed or pest problems and develop (in collaboration with group concerned) suitable treatments or ecological management advice (cf. Page & Richards [1977] for the case of the Variegated Grasshopper).

- An evaluation of the spontaneous spread of agricultural innovations among resource-poor farmers (to investigate more clearly what works and what does not, and why, and whether there are more widely applicable lessons or obvious bottleneck points the understanding of which might allow success in one area to imitated in another [cf. Lambert 1985]).

- Investigation of local concepts and management practices conducive to animal welfare, and into local skills in animal healing (indigenous veterinary practices) and possibilities for integration of indigenous and formal-sector veterinary practices (Bah 1985), perhaps based on the idea of support networks for indigenous veterinary practitioners to build on existing skill levels in areas where full veterinary services are ruled out on grounds of cost (cf. work on human health care delivery systems, Warren 1986, Last & Chavunduka 1986). The literature on pastoralism suggests that animal health and herd management are often integral issues, and that it is very difficult to improve on existing practices without a dramatic increase in costs. Interactive programmes linking indigenous and formal sector practitioners (and researchers) are likely to have their greatest relevance in "marginal" areas and high stress environments, e.g. where use is being made of draught animals for the first time (Bah 1985).

v. Obstacles to the implementation of PR

A number of possible limitations to the effective implementation of PR programs are evident and require brief comment.

a. Political and perceptual obstacles

In some cases antipathy to PR may be based on vested interests in maintaining the subordinate position of various resource-poor groups, or a fear that involving the rural poor more directly in planning their own future will stir up unmanageable political opposition (Whyte 1981). In other cases, however, opposition to PR arises from perceptual rather than political difficulties. Planners may simply not be aware of the problems faced by the poor, or of the considerable reserves of skill and initiative they command. Chambers (1983) suggests that blind-spots and mis-perceptions of this sort arise from the way the experience of experts is shaped and constrained by professional routines. Vehicle-bound professionals based in the capital city and tied by office routines may never see conditions in off-road settlements at the height of the wet season. The needs and interests of women farmers may be missed because the majority of aid professionals are males constrained by social convention from easy and informal contact with rural women, or because standardised household survey techniques have no place for complex intra-household sub-divisions of economic interest and responsibility.

When PR programs are being planned it is essential to be clear about both political and perceptual difficulties. It is important to assess whether or not a genuine conflict of interest exists. For example, is neglect of women food producers a perceptual problem, or would some other group lose out if more attention were paid to women farmers (cf. Rogers 1980, Swantz 1985)? Genuine conflicts of interest will have to be catered for by skilful dialog and negotiation. Where obstacles are largely percepetual, many difficulties can be resolved by attention to organization and training (Whyte 1981). Training is a topic dealt with in greater detail below.

b. Funding obstacles.

Although PR proponents stress that useful work can be done on very modest budgets (see Section C 4 below) there is bound to be resistance from R&D and aid program administrators to taking on additional responsibilities at a time of recession and contraction in aid and development budgets. Existing institutions and personnel will need to be carefully persuaded that PR is a logical development of existing trends and commitments, in order to alleviate the fear of a double cut (losing part of a tightly-constrained budget to a new area of research enterprise). This is why it is especially important to stress that PR is an outgrowth of well-established client-oriented policies advocated and implemented in US extension services and by some of the more enlightened colonial departments of agriculture. On a methodological level, it is equally important to stress the extent to which a number of current PR techniques derive from efforts to improve the speed and cost-effectivness of FSR as a diagnostic tool. On-farm trials programs, rapid appraisal surveys of farmer innovations and production constraints, village-level diagnostic workshops, and innovation user panels are some of the ideas that have emerged as ways of dealing with the basic problem of the time delays and expense associated with "classic" input-output FSR (Byerlee & Collinson 1980, Chambers & Jiggins 1985, Maxwell 1985, Whyte 1981).

c. Skill shortages and training requirements

It is clear that implementation of PR is in many cases likely to be obstructed by shortages of skilled and experienced personnel (due to previous heavy emphasis on the TOT approach in agricultural education and training). The answer is to tackle this problem through appropriate in-service training initiatives, syllabus reforms and recruitment and career structure reforms. There is major scope for aid assistance in these areas.

- Senior personnel (including aid agency personnel) need to learn at first hand from successful PR initiatives such as the Bangladesh On-Farm Research Project in order to break through some of the perceptual barriers imposed by what Chambers (1985) terms "normal professionalization".

- Agriculture students at all levels (MS, BS and Certificate) need to be exposed to PR ideas and methods. Typically, agricultural syllabuses need to incorporate more material on the following factors in particular: the ecological logic of resource-poor farmer survival strategies, the importance of social factors in technological change, the specific problems of women farmers in African agriculture, procedures for identification and evaluation of good local practices, strategies for organizing resource-poor groups (especially in politically unpropitious circumstances), and skills for two-way communication between researchers and resource-poor farmers. PR perspectives also need to be introduced into the syllabuses of industrial-country universities with strong Third World research and training interests.

- Particular attention needs to be paid to increasing the proportion of women students taking courses in agriculture. My final year class at Njala University College in 1983 had less than 5 per cent women. Sometimes the reasons are straightforwardly practical. The extension certificate training center at Njala - an aid agency project - was originally designed (about 10 years ago) without any residential accommodation for women students. Aid agencies must become conscious of the long-term consequences for assistance to resource-poor farmers of "ommissions" of this kind. In this case "male bias" has been built into the educational infrastructure of a country in which 50 per cent of all agricultural labour inputs come from women and further aid assistance will be needed to overcome this bias.

- Resources need to be set aside for the training needs of farmer groups taking part in PR initiatives. The strategy of recruiting "para-professionals" from within the farming community is also one to which serious attention should be paid.

It is important to realize, however, that there is another aspect to the skills issue. PR aims to mobilize and liberate hitherto under-utilized talents. This applies to existing professional skills as much as to skills in the farming community. A number of African agriculturalists are distinguished pioneers of the PR approach (cf. Igbozurike 1971a, 1971b, 1976). Others, convinced of its relevance and willing to do more, have been held back by peer review pressures and a hostile funding climate. Relevant changes in professional attitudes and support might release a surprising amount of hitherto "marginalised" initiative in this field. Equally, it is worth repeating the discovery of the Bangladesh group that PR brought to light hitherto unsuspected talents among junior and intermediate field staff. Excellent participatory work by extension trainees on the Certificate Program at Njala (Conteh pers. comm.) appears to confirm the judgement of the West Africa Commission (1943) over 40 years ago that a modest level of formal qualifications is not necessarily a hindrance to sensitive understanding of the ecological problems faced by small-scale farmers in tropical Africa. It is the strength of PR that it capitalises more effectively than top-down approaches on existing skills of this sort.

C. 3. *Implications for aid agency assistance*

Autonomy and self-reliance are important notions in PR. Top-heavy aid interventions would almost certainly be counter-productive. Nevertheless there a number of areas in which aid assistance could have a major catalytic impact.

a. As major patrons of international research into tropical food crops, aid agencies could foster a greater interest in PR in the International Agricultural Research Centers. Several centers appreciate the need for greater de-centralization of their research activities, and have begun to stress the importance of on-farm research. This might be the right moment, therefore, to interest some of these institutions in the more adventurous aspects of PR philosophy.

b. Many national agricultural research centers in Africa have fallen on hard times, sidelined by TOT and undermined by their small size and rapid staff turnover (Lipton 1985). From a PR point of view, aid assistance in their rehabilitation would have a high priority because they are closer (in geographical, ecological and socio-cultural terms) to resource-poor farmers than are the international research centers. Appropriately supported, it is possible to conceive national and local research centers recapturing an earlier self-confidence as primary focuses for meeting farmer R&D requirements. The research frontier for PR is high-quality, creative, interaction between farmers and scientists. National researchers occupy a strategic position on this frontier because they possess cultural, political and linguistic advantages over their international colleagues.

c. An aspect where aid donors could exercise especially beneficial influence concerns the system of rewards and motivations for professionals involved in agricultural R&D oriented towards resource-poor farmers (cf. Biggs & Clay 1983). As the principal patrons of tropical agricultural R&D, aid agencies have a major responsibility for creating new "poor positive" professional standards (Chambers 1985). Existing reward structures in projects supported by aid funding need to be modified to include greater professional recognition (salaries, promotion and awards) for skills and initiative relevant to better interaction between researchers and clients, e.g. linguistic and observational skills (cf. BARI/OFRD 1986) and successful performance of field work under arduous off-site, off-road, conditions (the hero-figure for PR is not a jet-setting winner of a Nobel Prize but a plant breeder on a bike). The PR approach will require more women professional staff for agricultural R&D activities, and aid agencies could take a leading role in accelerating the recruitment and training process (as well as assisting in solving some of the career disadvantages faced by women professionals in development work, cf. Nelson, 1981). Aid agencies could exert powerful "leverage" to ensure that research agenda were representative of the interests of resource-poor farmers by making institutional support, supply of vehicles and equipment, etc. contingent upon client consultation. Research funds could be ear-marked for individuals or institutions willing to experiment with PR methodologies at different stages of the agricultural research process. Almost by definition, dedicated PR researchers are those with least time or opportunity to further their careers by attending international conferences or writing up their research in ways that satisfy the editorial criteria of international journals (because they are working in remote localities under difficult conditions). PR requires its own, often innovative, professional support to deal with such difficulties, e.g. research networks and publication programs. Aid agency resources and experience would be valuable in establishing such activities.

d. PR places particular emphasis on the need to establish effective links between "formal sector" R&D institutions and "grass roots" organizations. Whyte (1981) points out that for poor countries with a multitude of small farmers to think in terms of one-for-one relationships between researcher and individual farmer is logistical nonsense. Outside any experimental phase PR has to be thought through in terms of links between researchers and representative groups of resource poor farmers. Mabogunje (1980) argues that unless priority attention is paid to the organization of rural people on the basis of group interests and solidarity then market forces, and development initiatives such as farm-access roads and improved agricultural inputs, simply serve further to "drain" rural areas of talent and resources. One of the key underutilized resources in African rural development is the capacity for self-organization, and development agencies should be looking for ways to assist and stimulate such tendencies. Self-help institutions are common throughout rural Africa. The range encompasses "traditional" co-operative work groups and savings clubs and "modern" organizations based on religious or community affiliation (Ames 1959, Bascom 1952, Beer 1976, Holmquist 1980, Painter 1986, Richards 1986, Seibel & Massing 1974). A number of such organizations have already had a profound effect on agricultural and rural development (cf. Barrett 1974, O'Brien 1971, Webster 1964). Although some of these groups are elitist or autocratic in organization others do appear genuinely to reflect the needs and interests of the poor (see Adams [1981] for an example, cf. Gupta [1985]). A well-organised farmers group, such as the Egbe Omo Ibile Awe of Oyo State Nigeria (a group with its own "development plan", EOIA 1982, cf. Adalemo 1985, Mabogunje pers. comm.), would be an obvious starting point for PR initiatives. In other circumstances, where there are no appropriate self-help institutions, PR will have to engage in its own organizational interventions (cf. Whyte 1981). In either case, aid assistance can often be most effectively channelled to such groups through non-governmental and private voluntary organizations (NGOs, PVOs), or through inter-group agencies that represent and co-ordinate NGO/PVO activities (e.g. the national Band Aid/Live Aid Committees in Mali and Burkina Faso).

e. A number of projects and agencies in the African NGO sector have already developed an active interest in PR, e.g. the ecodevelopment group ENDA (base in Senegal), the Cameroon-based *Association pour la promotion des initiatives communautaires africaines*, and the *Jipemoyo* project in Tanzania. This last group has been especially active in applying PR concepts to areas of interest to women (Swantz & Jerman 1977, Swantz 1985). Other NGOs are less well suited to PR. High levels of staff motivation and a modest scale of operations may obscure the adverse effects of continued commitment to top-down development practices (Harrell-Bond 1986). NGO mandates often specify the need for rapid action, and this emphasis on 'getting on with the job' sometimes results in hostility to any long-term research and evaluation. PR, although a different strategy for R&D, is still research. Accordingly, aid agencies interested in drawing in NGOs into the PR process will have to pick and choose with some care.

(para. to follow p. 58)

Special attention should be paid to the potential for PR initiatives in government-supported volunteer programs (Peace Corp, CUSO, VSO, and perhaps African student national service programs, e.g. NYSC in Nigeria). The special quality of such programs, from a PR point of view, lies in the fact that they are oriented towards the supply of personnel rather than projects. Their classic dilemma is that volunteers without projects to "sell" and conscious of their limited experience are assailed by genuine doubts about whether they have anything worthwhile to offer. PR offers a way out of this dilemma by redefining the volunteer's role as that of facilitator rather than an instructor. Volunteer programs have had some of their most notable successes where the volunteers concerned have discovered for themselves some of the basic premises of PR (VSO, Nurse & Tiernay, pers. comm.).

f. There is a strong case for specific US involvement in PR as an approach to the problems of low-resource agriculture in Africa. Three reasons stand out in particular. First there is the extent to which PR draws inspiration from the strong client orientation of US agricultural R&D and extension practices. Second, PR builds on and brings out the full potential of the "horizontal model" upon which earlier US interventions in African agriculture were based. Third, as should be apparent from earlier literature review, US researchers and academic institutions have been prominent among the pioneers of the approach (cf. Brokensha, Warren & Werner 1980, Horowitz & Painter 1986, Whyte & Boynton 1984 for synoptic viewpoints).

C 4. *Funding and cost implications*

The case for investment in PR rests on two arguments: past achievements when participatory approaches have been tried, and the present low-cost effectiveness of conventional TOT approaches in African agriculture.

i. Past record of PR.

Several major technological innovations in African agriculture in the colonial period were achieved solely or largely through mobilization of indigenous initiative and appropriate local institutions (Hill 1963, Hogendorn 1978, Martin 1985). Although there is little reliable evidence on the scale of returns, it is evident that government support (mainly modest investments in R&D and infrastructure) was sometimes quite effective in sustaining and further extending indigenous initiatives (Richards 1985, 1986). The report of the West Africa Commission (1943) was quite explicit in articulating a basic PR philosophy, and recommending its widespread adoption as a cost-effective means to support the best local initiatives in circumstances where public expenditure was under tight constraint.

Sierra Leone provided two specific examples of what could be achieved by "proto-PR" under such circumtances. Swamp rice cultivation in eastern Sierra Leone was doubled or trebled in 1920s apparently largely in response to a specific "sideways extension" program in which demonstration farms were established in each chiefdom by farmers from northern Sierra Leone temporarily recruited to the agriculture department as "para-professional" extension workers. This scheme was worked out after two experts from Madras had reported that there was little if anything they could teach the average peasant farmer in northern Sierra Leone about wet rice cultivation that was not already known and applied (Richards 1985). A revolving seed scheme, established in the late 1930s to facilitate the widespread distribution of pedigree rice seed, was also strongly "participatory" in feel, and included the best local selections in the material on offer. It was so successful among cultivators in the Scarcies region that 93,000 bushels were distributed in 14 years, after which it was terminated because the varieties in question were all in general circulation. The scheme was begun only after very careful study of Scarcies farming practices and consultation with farmers about varietal preferences.

Any formal computation of costs and rates of return would be difficult to compute at this distance but it is clear from surviving evidence that both projects had a major impact on the productivity of peasant rice cultivation in the areas cocnerned and were carried out on miniscule budgets. British funding for colonial agricultural development was notoriously parsimonious in the period in question. I believe further examples of successful support for indigenous initiative, despite a hostile funding climate, could be uncovered if systematic attention were paid to the history of R&D in the colonial period. It may be that modern development planners have underestimated the extent to which useful results can be achieved on very limited budgets when there is a high degree of rapport with the local farming community.

ii. Present cost-ineffectiveness of TOT

There is a consensus that tropical Africa is a "special case" as far as the GR is concerned. Expensive TOT-inflected R&D has not yet provided African farmers with a wide range of popular, adoptable input packages, with the dramatic impact on yields of GR technologies in Asia. IADPs are problem-ridden as delivery vehicles. Serious attempts to reach remote resource-poor farmers often run into insuperable logistical problems (e.g. the administrative and transport costs associated with supplying inputs and recovering loans in miniscule packages). Many countries are facing major problems in meeting the recurrent costs of IADP investments after the initial loan support period has lapsed. The emphasis in the PR approach is to attune R&D so well to typical resource-poor farmers' needs and circumstances that productivity-enhancing innovations will stand a fair chance of spreading of their own volition through informal channels and local institutions, thus dispensing with all but basic infrastructural aspects of the IADP delivery stage. Eventually PR aims to enhance or create the capacity of resource-poor farmers to develop their own innovations *in situ* (especially complex land management innovations involving highly specific adaptations to local conditions), thus invoking minimal additional "delivery" costs.

Precise costings, or rates of return, for PR programs are not readily calculable, partly due to lack of experience with the approach, partly due to intrinsic difficulty of applying standard accountancy and Cost-Benefit criteria to interventions which are intended to have a "catalytic" impact and stimulate or support spontaneous and organic change. One of attractions of TOT is that it lends itself to "projectization" (as in IADPs). The "advantage" (from an administrative point of view) of tackling rural development through projects is that their bounded character makes accountancy and evaluation straightforward. But this is to put the cart before the horse, because this boundedness also means that the benefits are difficult to sustain beyond the life of the project or replicate outside the project area. Some might be tempted to treat the apparent difficulty of calculating precise economic rates of return as an argument against PR. I would see it rather as a challenge to develop more sophisticated evaluation methods. (Stephen Biggs, pers comm., believes, however, that "hard-nosed" economic justification for PR is possible, and promises a paper on the subject 'within a month or two' [September, 1986]).

So far, the evidence suggests that in many areas PR ought to have cost-effectiveness advantages over TOT. In this respect, the following three points should be borne in mind:

- start-up costs for "piecemeal" applications of PR would (even should) be modest. It would largely be a question of cutting the coat according to the cloth available. One "entry point" might be to set aside a modest budget to support an in-service workshop in PR methods (mainly for established personnel), to mobilise some linkages with relevant grass-root organizations, and to fund a small research program to identify a range of farmer innovations and explore the potential of these innovations for further development and dissemination. A program of this sort (cf. Būdelman 1983) could be run by a small group of enthusiasts for a budget of a few thousand dollars per annum, assuming the personnel were already "in post".

- the initial criteria for the success of a genuinely effective "populist" interaction between resource-poor farmers and R&D agencies are the speed, ease and spontaneity with which any bio-technical innovations or management ideas spread, and the extent to which they trigger further adaptive responses, among intended beneficiaries. Historical analysis (Ruttan & Binswanger 1978) reveals a world-wide pattern of high returns to investment in agricultural R&D. There would be no reason to suppose that innovations generated by a populist programme would be an exception to this pattern provided the initial research was no more than averagely expensive and that the resulting innovations spread rapidly (free of the hidden delivery subsidies implicit in IADP development) and were in high demand (perhaps the acid test is whether or not farmers attempt to steal the experiments!). Thus a high rate of uptake by resource-poor farmers (both in absolute terms and relative to richer farmers) might be viewed as a sufficient surrogate measure of success in the first instance, though more formal socio-economic evaluation, and attempts to assess the impact on relativities between different resource-poor groups, would be valuable at a later stage.

- because PR throws its major emphasis on the process of generating a range of "farmer friendly" innovations, leaving the business of diffusion to informal processes at the local level, it promises major savings over conventional approaches by minimising delivery costs (e.g. efforts devoted to extension propaganda). PR enthusiasts would argue that uphill struggles by extension workers to persuade farmers to consider new agricultural technologies are presumptive evidence of inappropriateness at the R&D stage. Furthermore, where large numbers of resource-poor farmers are in no position, by reason of their poverty, to adopt an innovation package, this represents a major missed opportunity to harness human energy and ingenuity in the cause of increased agricultural production. The single most striking instance of this is the failure of conventional agricultural R&D in most parts of Africa in the last 25 years to capitalize on the skill and enthusiasm of female food producers. PR may not be able yet to meet formal economic assessment criteria but it has a coherent strategy aimed at doubling the size of the "market" for food-crop innovations by meeting the specific needs of women farmers. Perhaps the burden of "proof" should lie with the proponents of TOT, to "cost" *their* proposals for fulfilling this requirement?

Meanwhile, information about the cost-effectiveness of more elaborate PR interventions should be sought through careful evaluation of current applications (cf. Pinstrup-Andersen 1982, Lipton & Longhurst 1985 for comparable work on TOT programs). It would be helpful if some priority were to be attached, by an appropriate aid funding agency, to the collection of relevant data for the two Central American cases described by Whyte (1981) and the work undertaken by Dr Abedin, Professor Gupta and their colleagues in Bangladesh.

C 5. *Summary and conclusion*

The case for adopting PR is based on a biological argument (the potential importance to resource-poor farmers of farm-level agro-ecosystem adaptations), an analysis of the reasons why so many agricultural innovations generated through conventional R&D programs have low success rates for poor farmers in African conditions, and some (admittedly fragmentary) evidence in the historical record that high-quality interaction between farmers and scientists significantly enhances chances of success in food-crop development programs.

It is on this basis, then, that the paper has argued for some attention to be given to implementation of the PR approach. The paper has illustrated with a detailed example from Sierra Leone how detailed 'participatory' fieldwork might reorient research agenda, and has suggested what a full national program to derive an initial PR agenda might look like. The point was made, however, that there are many options short of full-scale implementation. PR is by nature gradualist and incremental, and would integrate well with a number of well-established trends in R&D in Africa (with FSR for example).

Indeed, there is much to be said for beginning cautiously. African agricultural development initiatives in the last 25 years have been disfigured by incautious promises and sudden shifts in intellectual fashion. However strong the argument in principle, PR has only a tenuous practical track record. The initial need, therefore, is to build up a better picture of what it might achieve in reality. This can only be done by action at the practical level. Perhaps the most urgent requirement, therefore, is to identify a small number of agricultural research and training programs (in African universities, or national and international research centers) where there is sympathy towards the basic orientation of PR and some track record of implementing FSR with farmer-participatory emphases. Funding should be directed, initially, to these institutions to establish exploratory PR programs based on strong links with local groups of resource-poor farmers. Further decisions about more comprehensive programs would then depend on the experience accumulated and results achieved in these exploratory programs.

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Problem-solving approach	*Technology looking for a problem*
Developing technology to spread in a given environment	Changing the environment to to make the technology spread
Specification of poor client groups	General description of all clients e.g. as 'farmers'
Holistic approach to understanding the problems of clients	Narrow approach to problem diagnosis
Participation of clients in research development and diffusion process	No participation
Multidisciplinary collaboration in the research, development and diffusion process	No collaboration
Social and environmental assessment and evaluation before, during and afterwards	None or only afterwards
Integration of the choice of technique and choice of social organization	Unintegrated selection of techniques or organizations
Dynamic flexible program responding to monitoring and feedback	Rigid unresponsive program
Use of indigenous technical knowledge and informal R&D processes	Little or no use of informal R&D

TABLE 1. Contrasted approaches to R&D for rural development

SOURCE: Biggs (1985)

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FINAL DRAFT

LOW-RESOURCE AGRICULTURE IN AFRICA

FARMING SYSTEMS RESEARCH AND EXTENSION: STATUS AND POTENTIAL IN LOW-RESOURCE AGRICULTURE

by

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I. INTRODUCTION: FSR/E AND CONVENTIONAL AGRICULTURAL RESEARCH AND EXTENSION

A. Status of African Agriculture and Need for the FSR/E Approach

Recent evaluations of African agricultural research and development have revealed two important problems. *First*, yields of food crops per hectare have stagnated or declined on a per capita basis in most Sub-Saharan countries. *Second*, research has produced few, if any, results that can be applied by low resource farmers especially where labor is scarce at critical times (World Bank, 1981; USDA, 1981; Fresco and Poats, 1986). Breakthroughs in production have not been made in major African food crops such as maize, sorghum, millet and roots and tubers. Current agricultural innovations are poorly adapted to Sub-Saharan rainfed shifting and fallow agricultural systems.

Solving these problems requires reorientation of two aspects of conventional agricultural research. First, constraints facing Africa's low resource agriculturalists must be identified so as to formulate more relevant research solutions. Second, adaptive research procedures must be used to test and modify innovative solutions to meet specific needs of these farmers and their highly varied farming systems. Farming Systems Research and Extension (FSR/E) provides an *approach* which will allow research and extension to develop more appropriate technological alternatives to solve the problems of low resource agriculturalists in Africa.

FSR/E can contribute toward the success of agricultural research and extension (R/E) programs in at least three ways. First, FSR/E helps determine research priorities among low-resource farmers which can help allocate scarce research funds to problems of greatest importance. Second, it enhances appropriate technology development through on-farm testing which increases the potential for success in extending innovative technologies to farmers. Third, it helps overcome existing biases of gender, age, ethnicity, and class by working toward holism in its diagnosis, design, experimentation, and dissemination stages (Fresco and Poats, 1986).

FSR/E is an *approach to and not a substitute for* conventional agricultural research and extension. It embodies conceptual and methodological tools to make existing R/E systems more efficient, not to replace them. FSR/E improves efficiency and effectiveness because researchers and extensionists no longer work entirely with isolated crop and livestock enterprises. Instead, work is conducted by interdisciplinary teams and the farm is viewed as a holistic system with interconnected subsystems. FSR/E encourages the research team to consider carefully the potential impact of a new technology on the whole farming system because a positive benefit to one subsystem may have a negative impact on linked subsystems and ultimately on the whole farming system. The systems perspective minimizes the potential cost of producing and implementing technologies which provide narrow short term solutions yet cause other more difficult problems. FSR/E is especially well-suited for working with low-resource agriculturalists because it operates within existing agricultural systems, works with farmers as cooperators, builds upon existing opportunities in designing solutions to problems, tests potential solutions against existing constraints and risks, and considers farmer adoption of technology as criteria for success.

A general consensus now exists on the basic assumptions, methodologies and objectives embodied in FSR/E (Fresco and Poats 1986; Norman and Collinson, 1985). The objective of FSR/E is to improve the well-being of farm families and increase their productivity by facilitating more efficient and effective generation of technology appropriate to farmer needs. Most practitioners agree that the approach progressively associates farms and farmers within appropriate domains and has four distinct stages in technology development.

1. Diagnosis of needs, problems, constraints, and potential flexibilities in the farming system;
2. Design of strategies to solve identified priority problems, ex-ante analysis of proposed solutions, and design (and redesign) of trials to test proposed solutions or better define farmer problems;
3. Experimentation, monitoring, modification, and verification of proposed solutions at farm level under local farmer conditions; supportive on-station research; and evaluation of farmer adoptability; and
4. Dissemination of farmer-approved results to relevant groups of farmers.

Each stage in the FSR/E process may be identified by slightly different names, depending on the country in which it is used. Some FSR/E stages may be subdivided and each stage may vary in length depending upon the results of the previous stage. They may also occur cyclically or simultaneously, depending on the nature of the research program; in most cases they are continuous activities (Galt, 1985b). See Appendix 1 for details on the activities associated with each stage.

B. Conventional Agricultural Research and Development of the FSR/E Approach

Research can be defined as the careful and diligent search for and interpretation of new knowledge through hypothesis testing. Agricultural research is the application of this search to the practical problems of producing, processing, storing and delivery of food to consumers. Before the 20th century, growth in agricultural production occurred almost entirely from increases in area cultivated. During this century, agriculture has been changing from "a resource-based sector to a science-based industry" (Ruttan, 1982). Growth in agricultural production is "increasingly based on new mechanical, chemical and biological technologies" and dependent upon industry and technology-producing institutions to package this technology in "new and more productive inputs (seeds, fertilizers, herbicides, insecticides, machines, and equipment)" (Ruttan, 1982). Agricultural research and extension have been both responsible for much of this change to a technology-based agricultural system as well as a result of the change.

Agricultural research and extension in its infancy was characterized by generalists, often farmers themselves, who did research on crops or livestock and who communicated their results directly to their neighbors. Early agricultural colleges promoted a generalist approach. As agricultural universities developed and agricultural research institutes were created, a separation occurred between research on a given topic and communication of the results. Research and Extension became separate functions. In some places (e.g., France), research was done entirely in institutes and teaching was relegated to universities. Extension was part of separate development oriented entities, later the locus for applied research, separate from the "pure" research of the institutes.

In the United States, agricultural research remained within universities, formalized by the land-grant concept which mandated three functions: teaching, research and extension. Though this mandate is still in effect, disciplinary separation and research specialization required to produce the "new technology" has caused an "institutional drift" away from the integrated perspective intended by the original land-grant concept (See Appendix 2 for further details). Researchers concentrated their efforts through departments based on disciplinary divisions, and developed specific commodity or crop research thrusts. The goal was raising production and the solution was sought mainly in varietal manipulation. At the same time, extension narrowed its focus to communication and lost its experimental role. Extension in the United States divided along gender lines; men were assumed to be producers with county agents (mostly men) assigned to serve their needs, while women were assumed to be homemakers and home economists were to assist them.

The creation of the International Agricultural Research Centers (IARCs), beginning with IRRI in 1960 and CIMMYT in 1966, followed some of these same premises and trends. Established to give greater impetus to research on key world crops, the IARCs provided good research conditions in tropical regions so researchers could achieve "breakthroughs" in crop production for the developing countries. The justification was the perceived food crisis and the need to create self-sufficiency in developing countries with large populations to feed.

Subsequent breakthroughs, via high yielding varietal tech-packs, became known as the "Green Revolution" and lead to greatly increased food production, primarily wheat and rice. Results with other food crops were less spectacular. Nonetheless, the success of the Green Revolution caused universities to become even more specialized in the training of new scientists to meet the demands for greater commodity production. Further specialization increased the disciplinary division among agricultural researchers, and lead to research problem identification and prioritization driven by discipline-based needs (publication in referred journals) rather than farming priorities. Researchers, no longer drawn largely from the farming community, had little first hand experience to use in making research decisions. Farmer input existed in the form of powerful lobbies of wealthy farmers whose farms matched conditions on experiment stations.

This specialized, discipline-based, commodity driven style dominates what is called conventional agricultural research and extension. Its research agenda is derived from previous published research experience and it occurs largely within the laboratory and the experimental station where non-experimental variables can be better controlled. For some farmers this research provides food productivity advances relative to labor and land. The current abundance of food in developed countries is largely due to these miracle technologies and farmers' ingenuity in applying them successfully.

Between 1968 and 1978, researchers from systems ecology, social science and agricultural economics simultaneously began to evaluate the new technologies and take a second look at the results of the Green Revolution. They concluded that many low-resource farmers (then called "small farmers") had not benefited from the new technology. Rather than blaming farmers for their non-adoption, some field scientists from the IARCs and national programs began to question the appropriateness of the technology itself. They found that the new technology could not stand alone but depended upon various inputs and infrastructural conditions, both of which are still disproportionately available to resource-rich farmers (Chambers and Jiggins, 1985). Without inputs and infrastructure and under low-resource farmer conditions, the technology performed the same as poorer than the farmer's own traditional technology.

This recognition lead to explorations of methods to produce technology more appropriate to the needs of low resource farmers. Depending upon the researchers' backgrounds, the institutional sources for their work, their ecological environments, and the farming systems they worked within, they put together different methods for generating technology more appropriate to low-resource conditions. Isolation of these independent efforts meant that there were many new brands of research being developed, each with its own leader and following. Actually, these approaches were similar responses to the same problem.

Beginning in 1976, researchers started to come together to exchange ideas. Because of personal vested interests and spontaneously differing terminology, less commonality surfaced than disagreement on definitions. Acronyms flourished and changed as rapidly as conferences were held. Information exchange was very informal, with photocopy machines replacing journals as the medium of communication. Much of the oral and written debate was never published. What was beginning to be called "Farming Systems" or "Farming

Systems Research" lived a life of its own, becoming more and more separated from the research and extension establishments. Evidence that this separate life was sufficiently important came in 1977 when Dillon et al., (1978) were asked by the Technical Advisory Committee (TAC) of the CGIAR to review FSR in four IARCs. This study, known as the FSR Stripe Review, was the first to examine FSR on an international basis.

As the FSR debate continued, many researchers, especially biological scientists, were left out of the discussion. They viewed FSR as a "soft" science, dominated by social scientists. On-farm research was messy and uncontrollable and certainly not publishable, therefore not worth doing. Other researchers viewed FSR as a new name for what extension should be doing. Many extension workers did not see FSR as offering any improvement over what they were doing. Opposition arose from farm management people who saw their methods being used under a new name. For others, FSR became a "catch-all" term for research that did not fit a normal research and extension framework (Sands, 1985).

In 1980, FSR efforts began to converge. More exchanges took place among FSR proponents and similarities and differences became clearer. FSR field workers began to publish in legitimate journals or high status publications. Kansas State University's annual FSR symposium, started in 1981, became an international forum for the presentation of theoretical and practical FSR results. National researchers from developing countries started to use FSR from their own perspectives, and funds were generated to enable them to attend international conferences. CIMMYT's Economics Program pioneered FSR work in East Africa and CIMMYT training documents began to define the FSR approach as more nationals were trained to conduct their own on-farm research.

USAID's Farming Systems Support Project (FSSP/University of Florida), created in 1982, began networking the FSR community. It created a newsletter, network paper series and annotated bibliographies in three languages to stimulate exchange across regional barriers and give field practitioners access to the wealth of formal and fugitive FSR/E literature. FSSP added the "/E" to the FSR acronym calling explicitly for the need to link researchers and extension workers with farmers in the process of developing appropriate agricultural technology. FSSP collected and organized methodological tools to formulate training materials for systematic teaching of the FSR/E approach to new practitioners. Especially important was the exchange of views between anglophone and francophone practitioners, either through multi-lingual facilitators, simultaneous translation of dialogs at conferences, or the growing insistance on translations of key documents. Fresco's (1984) analysis of the two traditions was a landmark piece which began an important process of understanding and reconciliation between these historically separate perspectives (see Appendix 7).

By the end of 1984, methodological consensus was emerging among FSR/E practitioners. Debates shifted from terminology and definitions to thoughtful discussions of content, results, implementation problems, evaluation criteria, farmer participation and adoption, and institutionalization. Practitioners viewed FSR/E as an approach for agricultural research and extension differing from yet complementing the conventional strategy, enhancing work with farmers ignored by the technification of agricultural research. A profusion of FSR/E acronyms still exists but practitioners today are more tolerant of differences and actively learning from the experiences of others. Appendix 3 provides a discussion of the different terminology in use by practitioners who employ a systems perspective in agricultural research, and Appendix 4 lists the definitions of acronyms found in the farming systems literature.

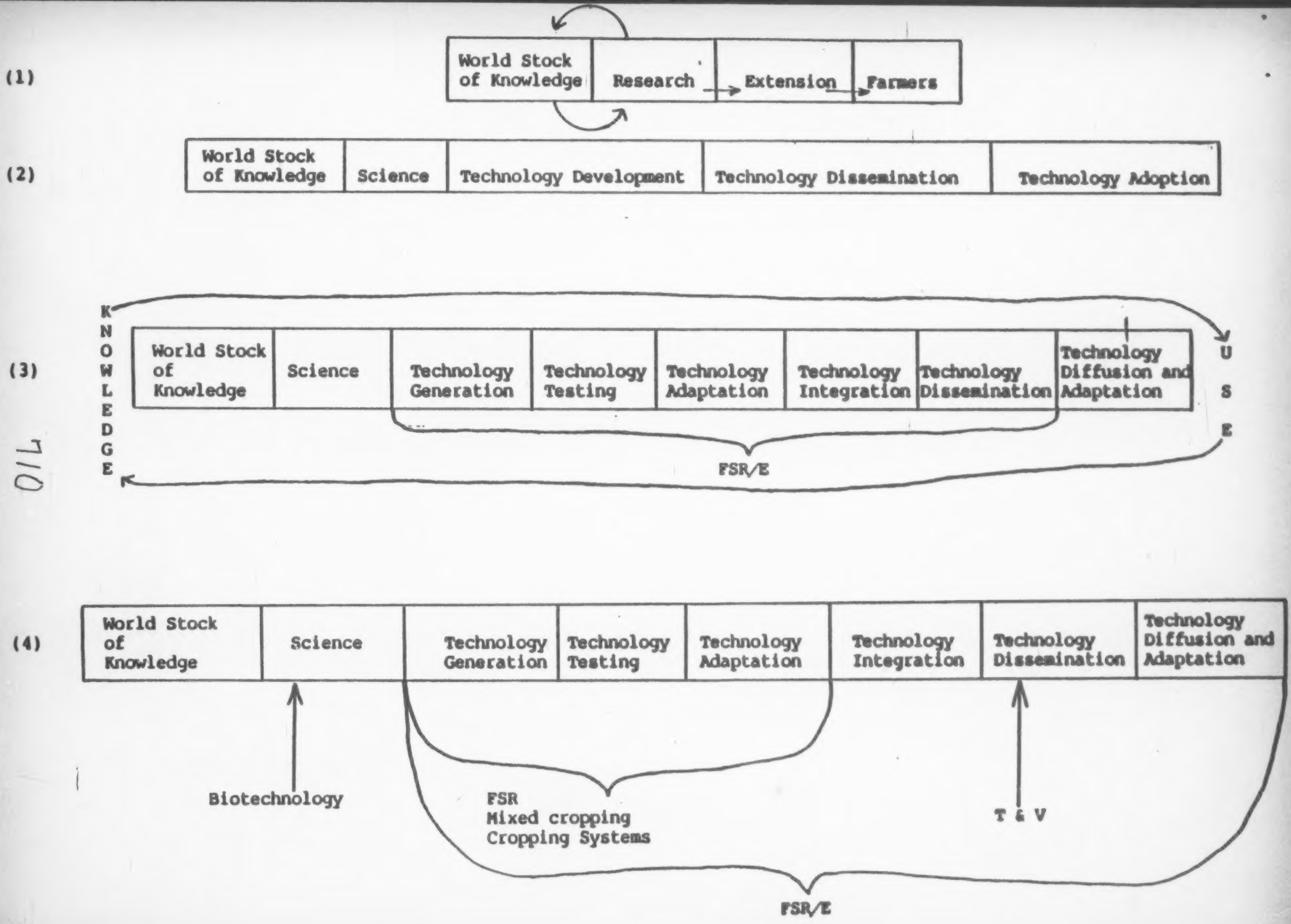
When viewed with a historical perspective, FSR/E is both old and new. It is old because many of its individual concepts, principles and methods have been used for over a generation in a variety of locations. Yet it is new because of the way these components are combined to provide a systematic approach to agricultural problem-solving. This historical view also shows that the conventional agricultural research and extension strategy, which is commodity, component and discipline driven, has not produced results that have greatly benefitted low resource farmers. The strategy assumes the availability of a suitable resource base in terms of land, climate, infrastructure; in essence, it is directed to non-marginal lands (Plucknett et al., 1986) and takes commodity choice for production as predetermined. It is clear that low-resource farmers farming marginal lands under low input, risk-averse systems, to produce a wide variety of subsistance crops, could be easily overlooked and ignored by conventional strategy.

The Green Revolution has reached perhaps 10% of the Third World's farming population, affecting yields positively on approximately 30% of their hectarage. Gains have been made mainly in wheat and rice and, to a much lesser degree, maize. However, not only has about 70% of the Third World's crops been by-passed by the complete technological package approach, but, more importantly, approximately 90% of the farmers have not benefitted from any of this technology. Logic dictates that FSR/E will have to complement conventional agricultural research to help fill this technological void. Some observers and donors have decided (based on little solid evidence) that FSR/E is more expensive than the conventional strategy. However, such an approach to development cannot be inexpensive: the numbers of farmers yet to be reached is of a staggering magnitude. Reaching them will require the combined perspectives and resources of both strategies. This means modifying the conventional strategy; a paradigm shift to accomodate a farming systems perspective, and in particular, the FSR/E approach.

C. Modifying the Conventional Strategy: Comparing Alternative Models

It is easier to demonstrate the modifications needed to improve the conventional agricultural research and extension strategy with several diagrams. In Figure 1 (1), the conventional strategy is depicted in a series of blocks. Research draws upon the world stock of knowledge and passes its results to Extension which in turn makes recommendations to Farmers. The model shows the separation of research from extension tasks, and the distance of farmers from researchers. Though a feedback loop is shown between research and the world stock of knowledge, the conventional strategy rarely acknowledges contributions from extensionists and farmers.

In (2), the concept of the total Technology Innovation Process (TIP) is introduced into the conventional strategy. Drawing from industrial research, a distinction is made between science and technology, one that agricultural workers have rarely made. Here the process is composed of a series of functions that are not actor-defined (e.g. Research = researchers, Extension = extension workers). Functions can be conducted by several actors working interdisciplinarily. On the far right of the process, dissemination is separated from technology adoption. The functional criteria for completion of the process is not only the mechanics of dissemination but determining whether


(1)
World Stock of Knowledge
Research
Extension
Farmers
(2)
World Stock of Knowledge
Science
Technology Development
Technology Dissemination
Technology Adoption
(3)
KNOWLEDGE
World Stock of Knowledge
Science
Technology Generation
Technology Testing
Technology Adaptation
Technology Integration
Technology Dissemination
Technology Diffusion and Adaptation
USE
FSR/E
(4)
World Stock of Knowledge
Science
Technology Generation
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Technology Adaptation
Technology Integration
Technology Dissemination
Technology Diffusion and Adaptation
Biotechnology
FSR
Mixed cropping
Cropping Systems
T & V
FSR/E

Figure 1. Conventional Agricultural Research and Extension Compared to Other Models of Technology Development.

the technology is adopted and used by farmers.

In (3), the technology development function is conditioned by the farming systems perspective and broken into the basic stages of the FSR/E process. Technology development requires a substantially different methodology than scientific research. FSR/E provides this methodology and conditions the center section of the TIP. There, it is not feasible to distinguish "research" and "extension" as they are involved in each function. The TIP model is a construct of the total process. It places the FSR/E concept within the total technology innovation process, but does not demonstrate the iterative dynamics of FSR/E, which are seen more clearly in the diagrams and discussion in Appendices 1, 3 and 4.

Other models have also been proposed to improve the conventional strategy. In particular, Biotechnology and the Training and Visit System or T&V (Benor and Harrison, 1977) are often discussed in donor circles as funding alternatives to improve agricultural research and extension. However, as shown in (4), these models propose refinements or improvements for specific segments but do not imply changes in the whole process. Biotechnology represents a new tool to use in the improvement of single commodities, either crop or animal. Its domain is within science at present, though there is great potential for its use in developing new technology for farmer use. However, since it will rely heavily on private sector support for technology development, there is some question whether the benefits will be accessible, much less appropriate, for low resource farmers since they do not represent a clientele with large technology buying power. Others such as Galt (personal communication, 1986) believe that successful biotechnology will depend on an increase in application of the FSR/E approach. This can be accomplished most efficiently by passing laboratory-based research results (including biotechnology innovations) as quickly as possible to the experiment station, and station-based research results to samples of farmers which are representative of some larger, but generally homogeneous, group of farmers. The only approach which currently addresses the latter link is FSR/E.

T&V is not a research model and is therefore not compatible as an alternative to other research models. It does offer refinement in the tools of information dissemination and a management system for information delivery, but it is not truely comparable to FSR/E since it lacks any research or technology-generating focus at all. Without appropriate technology to transmit, T&V does not have a base from which to operate. World Bank recognition of this is evidenced by their current efforts to initiate farming systems "style" projects to complement T&V projects already in place.

Some people have also compared FSR/E with models such as cropping systems research (which focuses only on the crops in the farming system) or mixed farming research (which draws practitioners' attention to the integration of crop and livestock problems and solutions). The problem with these models, as described in Appendices 3 and 4, is that they are too limited in scope or do not explicitly consider extensionist involvement and the dissemination-adoption functions. They are better viewed historically as parts of the building of what is now FSR/E. In this context, Appendix 3 (Figure 1) places these earlier models within the larger framework of FSR/E because they operate in an iterative fashion to build improvements upon existing farming systems. Diagram (4) in Figure 1 shows FSR, Mixed Cropping and Cropping Systems as operating in only the first three functions of Technology Development, while FSR/E encompasses all three and thereby conditions the entire process.

Table 1 compares the models discussed above with the conventional strategy in terms of their purpose, clients, how research priorities are established, requirements for operation, and the actors involved. This comparison makes it obvious that individual models should not be selected one over the other, but that all should be considered essential elements to improve the overall strategy for good agricultural research and extension.

FSR/E is often viewed as revolutionary when compared with the traditional agricultural research and extension strategy. However, it is better understood as an evolutionary development. In keeping with its mandate to make research and extension more efficient and effective, the future goal for FSR/E is to become a normal, necessary part of good agricultural research and extension. Active involvement of farmers - male and female - as colleagues and partners in the technology development process, and an explicit effort to learn from farmers, will ensure achievement of this goal.

Table 1. Comparing Alternative Models with the Conventional Agricultural Research and Extension Strategy.

Strategy	Purpose	Client(s)	How are research priorities established?	Requirements for Operation	Actors Involved
Conventional Strategy	To develop knowledge needed to improve agricultural productivity stability and quality.	1. Theoretically all farmers but in practice has benefitted mainly resource rich farmers. 2. Tendency to be research or peer group oriented.	1. By the discipline and its publications 2. Based on outcome of previous laboratory or station-based research. 3. By state or federal authorities primed either by lobbies, changes in marketing, or catastrophic problems (corn blight, citrus canker, medfly).	1. Research institutions with laboratories and libraries 2. Experiment stations 3. Limited sites for multi-locational testing	Researchers and Extensionists
T I P	To draw from knowledge in order to develop technology that farmers can use.	All Farmers	By assessing technology needs and problems of farmers.	1. Research institutions. 2. Experiment stations 3. Extension service 4. Cooperating farmers	Researchers and Extensionists
Biotechnology	To incorporate genetically better traits into existing crops or livestock through use of "new science", including recombinant DNA cell fusion and micro-injection.	1. Ultimately all farmers, but given trend towards private, commercial investments in this research, the Clients will need large resources to purchase the resultant products or be heavily subsidized. 2. Intermediate client is clearly researcher.	1. By scientists engaged in Biotechnology research. 2. By companies and institutes funding research.	1. High tech laboratories 2. Extensive international germ plasm banks	Researchers
T & V	To better extend the results of research or Technology generation	Developed to serve low-resource farmers who have been ignored by conventional extension, but can be applied to all farmers. In practice, some indication of bias to male higher-resource farmers with better education.	Is not research.	1. Adapted and proven technology to deliver 2. Mobility to get to farmers 3. Extension centers	Extensionists
FSR/E	1. To improve research - extension - farmer integration. 2. To condition the TIP to better deal with the farming system, especially low-resource farming by selecting problems from a farming system and testing innovations within the system against the system's own criteria.	Developed to serve low-resource farmers in developing countries who were not benefitting from results of conventional strategy but can be used with any farmer group.	Determined from within the farming system based on diagnostic methods including interdisciplinary informal and formal surveys, and on-farm trials.	1. Research institutions and experimental stations 2. Extension centers 3. Cooperating farmers 4. Field logistical support for diagnostic and on-farm experimentation	Researchers, Extensionists and Farmers

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II. EVALUATION OF FARMING SYSTEMS RESEARCH AND EXTENSION (FSR/E)

A. Current Philosophical, Financial and Institutional Status of FSR/E

1. WORLD BANK.

The World Bank has been utilizing the Training and Visit (T&V) extension system for a decade as a mechanism for more efficient delivery of technological innovations to the poor farmers of the third world (Benor and Harrison, 1977). So far, the results have been disappointing because adapted technology to fuel the T & V system is not available in most countries. For this reason, in 1983 the Bank commissioned an exhaustive study to evaluate the farming systems approach (Simmonds, 1985), and has initiated or planned farming systems projects in Senegal, Ethiopia, Zambia and Ivory Coast. A prevailing topic at a conference including West African research, extension and educational institutions who met in Ivory Coast under Bank sponsorship in February 1985, was complementary elements of FSR/E and the T&V approach. The Bank and other donors were challenged by the representatives to consider provision for more emphasis on design of on-farm research programs identified with sets of farmers with like conditions to enhance extension. Of major importance to the group assembled was concern for developing technology suited to women farmers, a significant force in food production in the region.

While a quantitative assessment of Bank emphasis on the farming systems approach in funded projects is not possible, the approach is influencing agricultural projects both directly and indirectly through application of FSR/E methodologies with a greater sensitivity to the technology development need for major client groups. The question of real or perceived strengths and weaknesses of FSR/E by Bank project managers and recipients deserves further application and evaluation. Bank investments in training for FSR/E applications generally have not been emphasized so effective utilization of the methodologies often awaits trained human resources. Recognition that the T&V approach is dependent upon an effective technology development process has stimulated Bank interest in FSR/E.

Ex-ante evaluation of Bank investment in research through cost-benefit analysis is not considered effective. A recent Bank document (World Bank 1986) indicated that "no attempt has been made to quantify the economic rate of return ex ante, due to :

* inherent uncertainties regarding the timing and value of research findings, and the timing and extent of adoption of research findings by farmers;
* difficulties in separating potential benefits of research and complementary investments, such as input supply, extension and training; and
* problems in assessing the value of negative research results, which add to the pool of knowledge and frequently benefit subsequent research efforts.

The same paper suggests that evaluation is possible for expected qualitative benefits such as improved technical recommendations for targetted groups of farmers, better selection of improved varieties adapted to both agroecological conditions and farmer management practices, and better conservation and utilization of national resources for sustained agricultural development.

2. USAID.

USAID was one of the first donors to invest significantly in FSR/E projects. In 1972, AID, with The Rockefeller Foundation, supported the initial studies that resulted in the formation of ICTA, the Guatemalan Institute of Agricultural Science and Technology (see ICTA case study in Appendix 10). This institution offers an excellent farming systems model to the world. Several other projects were funded by AID in the late 1970's through which the FSR/E methodology was further developed and refined (e.g. in Indonesia, Honduras, the Eastern Caribbean and Lesotho during the period 1978-1980).

In December, 1980, USAID convened a group of FSR/E practitioners to discuss implementation of FSR/E projects and their future. The general consensus was that FSR/E, as an approach, was going to expand significantly in the future and, furthermore, that USAID was committed to such an expansion. In 1985, a worldwide inventory of farming systems projects (FSSP Newsletter, 1985) identified 256 different projects including 95 in Africa. USAID supports or has supported FSR/E projects, or projects with FSR/E components, in India, Indonesia, Jordan, Nepal, Philippines, Sri Lanka, Thailand, and Western Samoa. In Sub-Saharan Africa, similar USAID-supported projects are in Botswana, Burundi, Cameroon, The Gambia, Lesotho, Kenya, Liberia, Malawi, Mali, Mauritania, Niger, Rwanda, Senegal, Sierra Leone, Somalia, Swaziland, Tanzania, Zaire, Zambia and Zimbabwe. In Latin America, similar USAID-supported projects are in Bolivia, Dominican Republic, Eastern Caribbean (CARDI), Ecuador, Guatemala, Haiti, Honduras, Panama, Peru, and Paraguay.

Several of the USAID-funded Collaborative Research Support Programs (CRSP) have FSR/E components: Bean/Cowpea CRSP - Ecuador, Guatemala, Tanzania and Malawi; Soils Management CRSP - Indonesia; Sorghum/Millet CRSP - Mexico, Honduras and Sudan; Small Ruminants CRSP - Kenya and Peru. Most of these efforts would not be classed as full FSR/E projects, but they utilize many of the elements that are common to FSR/E programs (see also CRSPs in Section III, A. Linkages Between Commodity Research and FSR/E).

Evaluation of USAID-funded FSR/E projects on a quantitative basis is as difficult as it is for World Bank. It was not possible to make a quantitative evaluation for this paper. In USAID's experience it might be noted that impediments to precise benefit evaluations are inadequate cost data and definition of specific projects "designated" as FSR/E projects, lack of measures of returns to research, heavy expatriate involvments so that costs are not reflective of the project and complications associated with attributing benefits, or lack there of, to causal factors. If we assume that an average FSR/E project for USAID is on the order of $10 million and five years in scope, careful scrutiny might show that one dollar in three does not leave the U.S., another one goes directly to expatriate travel, maintenance and salaries, and the remaining dollar may go to items and personnel to support the FSR/E project directly in the field. However, these investments may contribute to training in the U.S. where the return may be 10 years away and attrition of trained resources is common. This should not mitigate against technical assistance, but should explain why the cost component of the total effort is not a realistic base for evaluating FSR/E even if benefits were quantifiable.

During 1982 and 1983, several of AID's early FSR/E projects were evaluated (Central America: Hobgood et al., 1980; Guatemala: McDermott and Bathrick, 1982; Korea: Steinberg et al., 1982; Nepal: Simmons et al., 1982; Eastern Caribbean: Everson et al., 1982; Lesotho: USAID 1983a; Malawi: USAID 1983b). Four consistent problems appeared:

* most of these projects were poorly conceived and designed,
* very few projects were staffed by experienced FSR/E practitioners,
* U.S. bilateral contractors were seldom able to field the originally-proposed team members, and

* seldom did expatriate researchers in the field interact and work together with host country counterparts as a multidisciplinary team.

In partial response to the above problems, USAID established in October 1982 a centrally-funded project, located in the Bureau of Science and Technology, to backstop and support USAID projects on a world-wide basis. The University of Florida was chosen to lead this project, known as the Farming Systems Support Project (FSSP). The project was implemented through the combined resources of 21 U.S. Universities and four private consulting firms. As a cooperative agreement, the FSSP, among other tasks, was to assist bilateral contractors and USAID Missions to locate and train technical assistance teams for future FSR/E projects, as well as assist in the replacement staffing of on-going projects.

During the past four years, expected improvements in USAID-funded FSR/E projects have been slower than anticipated and the S&T Bureau is much less interested in investing in future FSR/E support. Funds are currently dedicated to biotechnology research or more traditional commodity research (USAID, S&T 1986). FSSP was developed in the Development Support Bureau, under an administration which mandated that the major purpose of central bureaus was to support field operations. With the change in administration, the Development Support Bureau became the Science and Technology Bureau and emphasis changed from support to science and technology. The S&T orientation is to get more science and technology into country programs. The program is guided more by central bureau criteria than by field program criteria.

In contrast to the de-emphasis promoted by the S&T Bureau, the Africa Bureau through its country missions continues to support and plan projects incorporating the FSR/E approach. This comes largely as a result of national programs and their projects which are showing a steadily growing realization of the use and benefits of the FSR/E approach. As FSR/E has moved away from being a "project" itself, to being understood as an essential element within the agricultural research and extension process, practitioner demand for FSR/E support has grown. This demand for support is channeled to donors, like USAID Africa Bureau where it is recognized that FSR/E provides an evolving mechanism to strengthen national research and extension efforts. The Africa Bureau has become more rigorous in designing and reviewing FSR/E projects because of problems encountered in earlier FSR/E projects and because of budgetary constraints. Examples of new projects (1985-86) incorporating the FSR/E approach are in The Gambia, Mauritania, Mali, Niger, Zaire and Malawi.

It is not known if the FSSP will be renewed after September 1987. However, all of the FSSP support entities and many USAID Missions, are convinced of the validity of, and necessity for, some type of FSR/E approach (FSSP On-Networking, 1986; Mission cables in response to evaluation of FSSP, June, 1985). The University of Florida and the FSSP support entities are interested in continuing the project, based on direct support to missions, consisting mainly of training and networking.

Criticism within USAID directed at FSR/E varies in substance and relevance. Many of those who promoted the greatest expectations were not practitioners and became impatient. FSR/E methodology is not yet standard and many of the FSR/E workers are still learning it. Few FSR/E programs are "fully in place" and operating on a scale that can have a significant impact on the agricultural development. Criticism also stems from conventional researchers because some early proponents rationalized the need for FSR/E in terms of conventional research failures rather than potential for complementarity. Another source of criticism arises when FSR/E projects are designed to stand alone without adequate attention to linking with sources of technical support. Finally, one source of criticism, based on the obvious fact that field research will be more costly than on-station research, ignores the product side of the equation, and ignores the probability that over time significant operational efficiencies will be achieved. (See IDRC in Appendix 8 for a different donor perspective on supporting FSR/E.)

3. International Agricultural Research Centers (IARCs)

The growing recognition of the value of the FSR/E approach was also discussed in a conference attended by representatives to the IARCs Workshop on Farming Systems Research:

> "A farming systems approach is now being adopted and incorporated by many research systems. This is reflected in increased contact between scientists and farmers, a greater sensitivity of scientist to the complexities of small farmer systems and changes in atti-

tudes of scientist toward addressing farmer problems. Results of on-farm research have been particularly valuable in feeding back information to on-station research and changing priorities accordingly. At the same time, as the farming systems approach matures in many programs, there is growing evidence of acceptance of technologies being generated." (Andrew, unpublished notes from ICRISAT Workshop, February, 1986).

Concensus is emerging within the IARC community about research with a farming systems perspective (FSP). Direct attention is not given to the research/extension linkage but recognition of the important role of national institutions in extension is quite common. At the recent meeting of International Agricultural Research Centers (IARCs) representatives at ICRISAT in February of 1986 (FSSP, 1986a) it was agreed that the essential underlying concept of research with a farming systems perspective is that it is an approach to agricultural research, ultimately serving extension, which embodies the following concepts:

* Problem-solving research which explicitly recognizes farmer as the primary client of agricultural research systems.
* Research which recognized interactions between different sub-systems in the farming system and which may often require a multi-commodity approach.
* Research with an inter-disciplinary approach that requires close collaboration among technical (physical and biological) and social scientists.

The financial status of the IARCs relative to other agricultural research groups has been good. Investments in FSR vary by center and region for each center but have increased over time in the aggregate and as a complement within both commodity and constraint oriented programs. Currently FSR accounts for up to 10% of the budgets of various IARCs, or a total of $10-15 million per year for the CGIAR centers as a whole (Anderson and Dillon, 1985). Forty percent of IITA's budget is related to FSR activities (Hildebrand, personal communication, 1986). An evaluation of the IARC network has been completed and results will be forthcoming shortly which should provide better information on the returns to the investment in FSR by the IARCs. However, an evaluation of one IARC/host country FSR activity demonstrated a rate of return to investment of 188 percent (see Appendix 14, Case Study: Panama).

Specific activities of the IARCs in Africa which carry a farming systems perspective are described elsewhere (Norman and Collinson, 1985; Fresco and Poats, 1986; Anderson and Dillon, 1985; Simmonds 1985; Sands, 1985; Rhoades and Potts, 1985). Common methodological threads do exist among the IARCs active in Africa. All centers identify the same or almost the same procedural stages, but implementation differs. Little concensus exists on the appropriate methods of diagnosis and each promotes differently the use of informal and formal diagnostic tools. Most IARC activity has "a pre-determined focus" on a specific crop or commodity (see examples below in A.5. and Appendix 3). Though not a major initial problem, this poses a challenge to national agricultural research and extension systems if each commodity has a different IARC backstop or collaborator with a different set of jargon and specific methods to be followed. Institutionalization of FSR/E within any national systems requires an agreement on FSR/E among the different commodity programs and a national approach shaped to fit national needs. Better IARC collaboration, such as the Inter-Center Consultation (CIMMYT, 1984) will help this process.

4. Universities

a) Domestic Programs. The philosophy of those U.S. universities which have begun domestic, state-level FSR/E approaches, has been to once again make agricultural research responsive to their limited-resource farming clientele (see Land-Grant Case Study, Appendix 2). With few exceptions, these approaches can be characterized as being incremental in nature. The known exception is at Sam Houston University (Texas), where a "model farm" approach is used. This is similar to IITA efforts (See Section II,5,a.;Appendix 3, Figure 1).

Since 1980 when the University of Florida began the first U.S.-based FSR/E project in northern Florida with USDA funding, nine other universities have followed this lead. There are now university programs located at Alabama A & M, Colorado State, Cornell, Fort Valley (Georgia), Hawaii, Minnesota, North Carolina State, Southern Illinois and Virginia Polytechnic and State University. Courses in FSR/E methods were first given at the University of Florida and Cornell University (ca. 1980). From this beginning, at least eight additional U.S. universities offer FSR/E courses, or courses incorporating the FSR/E approach, including Arizona, California (at Davis), Colorado State, Hawaii, Kansas State, Kentucky, Michigan State, Minnesota, and Virginia Polytechnic Institute and State University. In addition, the University of

Florida now offers a minor in farming systems to both M.S. and Ph.D. level students and awards four assistantships annually for specific FSR/E study.

The philosophical and financial committment of these institutions is substantial. It is never easy to introduce a change into a system (in this case, that of the land-grant) which is more than 100 years old. However, the fact that so many major U.S. universities have either undertaken the effort of introducing FSR/E at their respective state levels, or have altered curricula to include teaching and training students in the methods of FSR/E, qualitatively proves their committment. Finally, some of the USAID strengthening grant monies has gone into supporting many of these activities.

b) Programs In Other Countries. With similar needs to make research more efficient by focusing more directly on limited-resource farming clientele, other countries have begun to incorporate FSR/E concepts and approaches into their university curricula. The following European universities have incorporated FSR/E into their curricula: IDS/Sussex and the Imperial College of Science and Technology, London, Great Britain, and The Agricultural University, Wageningen, The Netherlands. In Central America, CATIE (Turrialba, Costa Rica) incorporates the FSR/E approach into the curriculum. In Southeast Asia and the Pacific, the six universities of the Southeast Asian Universities Agroecosystems Network (SUAN) all offer instruction in the philosophy of FSR/E (Bogor and Padjadjaran in Indonesia; Baguio and Los Banos in the Philippines; Chiang Mai and Khon Kaen in Thailand), as does Hawkesbury College (Australia).

African universities are also playing a growing role in the operation of FSR/E projects, and increasingly, in teaching FSR/E methods. Four Nigerian universities, operating from their own adaptations of the U.S. Land Grant Model, have on going FSR/E projects with formal linkages to their national FSR/E program. The University of Zimbabwe has a FSR/E project with informal linkages to the national FSR/E unit, and also operates an annual training program with support from CIMMYT's East African Programme. Sokoine University in Tanzania, Egerton College in Kenya, the University of Swaziland, Njala University in Sierra Leone and the University Centre Dschang in Cameroon all have on going FSR/E projects, and Makerere University in Uganda is starting a similar effort. Njala offers courses in FSR/E methods and students gain hands-on experience in the field project, supported by IDRC. Cameroon's effort is quite new, but has the same objective as the Njala program.

5. National Agricultural Research and Extension Systems (NARES)

The acid test for FSR/E is "the extent to which these procedures are permanently institutionalized in national programmes with adequate policy and financial backing" (Chiduza and Rukuni, 1985). While donor project evaluations are one measure FSR/E status, they should not be the only criteria. Donors can be insensitive to national feeling and ruled by fads and fashions.

Many long-time FSR/E practitioners worry that donors have moved too fast, too soon and with too much money in FSR/E (Norman and Collinson, 1985). Large projects were designed before local management expertise was developed and were implemented by expatriates with little FSR/E experience. Little thought was given to institutionalization. Donors sometimes equate the building of an experiment station with developing an FSR/E program. Unfortunately, bricks and mortar are more easily set into place than new paradigms for solving difficult problems. Donors are now evaluating young FSR/E projects expecting to find solid institutionalization where concrete has barely begun to set. Developing national and international capacity is a slow process and must be considered carefully in evaluations (Norman and Collinson, 1985). Fortunately, there is evidence that things are changing. Donors, particularily USAID, have become more rigorous in design and review procedures. More emphasis is being placed on training national practitioners (Gambia GARD Project/Univ. Wisconsin/USAID), structuring internal evaluation and monitoring mechanisms (Mali PRSPR Project/SECID/USAID) using better diagnostic methods (Mauritania AGRES II Project/Univ. Arizona/USAID) and involving extension workers (Niger APS Project/ Labatt-Anderson/USAID).

The progress of FSR/E today is best seen by reviewing the status of national programs in Africa, Asia and Latin America. Recent conferences and workshops (1985-86) with national researchers, extension workers, and program leaders on the state of FSR/E in their respective countries provide the material for this review.

a) Africa. FSR/E is rapidly gaining a place in agricultural research and extension programs, with thirty-five out of forty-one Sub-Saharan countries reporting some level of activity. FSR/E is not new to the region. Eicher and

Baker describe an "invisible literature on FSR in Africa which can provide a perspective on current FSR programs" (1982). They cite experiences of the Cotton Research Corporation in Uganda in the 1950's, the Uboma study in eastern Nigeria in the 1960s, and the Experimental Units in Senegal's groundnut basin in the early 1970s as predating contemporary FSR/E programs. These experiences demonstrated that on-farm research is not a luxury but a necessity in shaping national research programs; multidisciplinary teams incorporating social scientists are essential to agricultural research; and farmer testing of technological inovations is needed prior to dissemination by extension.

Early efforts to employ a farming systems perspective were essentially descriptive studies of traditional farming in various ecological regions of the continent and among different ethnic groups (e.g.,Ruthenberg, 1980). Some projects are still mostly descriptive and classed as Research on Farming Systems (Appendix 3, Figure 1). Moving beyond description for many projects was difficult due to use of large formal surveys which did not provide timely results and required an inordinate amount of time in data collection and analysis. Developing cost-effective diagnostic tools has become a key objective of current FSR/E projects.

Subsequent efforts can be grouped as either (1) projects aimed at designing new farming systems (NFSD) to replace traditional farming systems or (2) projects attempting to integrate technological and institutional change for specific target regions (FSRAD) (See Appendix 3 for details on these types). Implementation difficulties with both have hindered success. The unit of analysis in both is an entire farming system (NFSD) or an entire region encompassing one or more farming systems (FSRAD), resulting in insufficient disaggregation of data. NFSD is expensive in terms of budget and personnel and must be conducted on a very large scale, placing it beyond the financial capabilities of most national programs. The most prominent NFSD effort today is at IITA. Their objective is to replace shifting cultivation with a more stable and productive agricultural system. The effort is a top-down exercize in modeling "what could be done in a particular situation with existing know-how" (Norman and Collinson, 1986).

Some reject NFSD because it is "playing house with the farming system," and "devoid of any connection to reality" (Bremmer, 1983) but in areas of ecological catastrophe or prolonged drought NFSD may be needed to continue farming at all. Step-wise improvements may not be enough to bring production back up to even subsistance levels. Areas with intensive repopulation may also need NFSD to meet the needs of farmers unfamiliar with new ecological zones.

FSRAD is typified by French R-D (see Appendix 7) projects in Senegal, Burkina Faso, Algeria, Tunisia, Mali, Niger, Cameroon, and Ivory Coast. Its objective is long-term technological and institutional development of a region. Interventions can be technical, socioeconomic, political, or deal with their linkages. FSRAD solutions to farmer production problems may not always be technical but often require alterations in infrastructure or policy. In practice FSRAD is difficult to manage due to its complexity and requires significant long term outside donor support. Few purely FSRAD projects exist today.

Recent reviews (Fresco, 1984; Fresco and Poats 1986; and Bellon et al., 1985) have used the Francophone-Anglophone dichotomy as a tool for classifying the various FSR/E approaches in Africa (see Appendix 7). However, since a greater number of national programs demonstrate combinations of both Anglophone and Francophone traditions, this tool has become less useful for analyzing the progress of FSR/E development. Considerable convergence now exists between the two, and it appears that FSR/E is moving "towards a middle ground in West Africa which will exploit the strengths of both Francophone and Anglophone research and development experiences and minimize the weaknesses of each approach" (Baker and Norman, 1986).

Currently, most national programs are using or exploring some form of FSR/E within their agricultural research and extension systems. Though many do not call their activities "FSR/E", most are grappling with linkages between research and extension. Table 2 classifies countries according to the degree to which FSR/E is, or is being, institutionalized. Group 1 countries have made changes in the institutional organization of research and extension to accomodate FSR/E. External funding, often substantial, is still present, but national committment to FSR/E is strongly evident. Group 2 countries have significant differences among them in regard to level of experience with FSR/E and relative strength of R-E linkages. In group 3 countries, FSR/E has often occurred in fits and starts without sustained effort, yet all are implementing or plan to implement pilot projects in the near future. Political problems in

Table 2. African Countries Classified According To Relative Degree Of FSR/E Institutionalization

GROUP 1 COUNTRIES: Reorganized To Accomodate FSR/E	GROUP 2 COUNTRIES: In Process of Re-organization, Or On-Going FSR/E Projects	GROUP 3 COUNTRIES: Some Pilot FSR/E Efforts	GROUP 4 COUNTRIES: No Information Available
Malawi	Botswana	Uganda	Angola
Zimbabwe	Ethiopia	Somalia	Rio Muni
Nigeria	Kenya	Mozambique	Central African Republic
Senegal	Sudan	Mauritius	
Mali	Swaziland	Guinea	Namibia
Burkina Faso	Rwanda	Guinea-Bissau	Gabon
Lesotho	Burundi	Congo	Chad
Zambia	Zaire	Cape Verde	
Tanzania	Ivory Coast		
	Sierra Leone		
	Gambia		
	Togo		
	Cameroon		
	Liberia		
	Niger		
	Ghana		
	Madagascar		
	Benin		
	Mauritania		

some have precluded sustained donor support (e.g., Uganda, Somalia, and Mozambique). The paucity of FSR/E materials in Portuguese hampers expansion of the approach in Mozambique and Guinea-Bissau.

The institutional structure for FSR/E differs considerably from country to country. Each national setting has unique peculiarities and twists, with institutional structures to reflect these. Currently, African leaders are exploring better institutional frameworks for organization and implementation of FSR/E by exchanging experiences with other countries through regional networking. Eastern and southern countries are linked through the CIMMYT program, while West and Central countries are linked through the West African Farming Systems Research Network (WAFSRN) which held its first symposium March 1986. Zaire, Rwanda and Burundi share results through the great lakes regional organization and research institute, IRAZ. Networking across East-West boundaries began through joint efforts of CIMMYT and FSSP at the Egerton Workshop (August, 1985). SAFGRAD OAU/STRC offers another vehicle for networking and exchanges among those African countries in the Sahel. Thematic networks like the West African Integrated Livestock Systems Network (Poats and Starkey, 1986) have also been established.

Institutionalization of FSR/E has not been an easy task in African countries. Many, like Botswana, have had a relatively long history of FSR/E, but "development has been on a project orientated ad-hoc basis and only now is serious thought being given to how these various projects can be integrated into a cohesive national programme" (Chiduza and Rukuni, 1985). Despite difficulties and variations in national structures, at least six patterns of institutionalization can be discerned in Africa. The first pattern has a coordinating body operating at the national level, usually from within a research organization. A second places FSR/E in a department or a program in the national research organization. The third creates area-focused adaptive research teams with liaison to national level commodity teams. A fourth pattern shows no institutional changes and FSR/E is initiated within existing structures, often as a pilot project. A fifth pattern is observed when FSR/E operates within commodity programs. The sixth pattern is demonstrated by those countries where FSR/E efforts are initiated by universities (see examples in Section II, A,4.b.). Table 3 gives examples of most of these patterns and compares selected countries by institutional type, donor support

Table 3. Type of FSR/E Institutionalization, Donor Support and Results to Date for Selected African Countries.

COUNTRY	TYPE OF INSTITUTIONALIZATION	DONOR SUPPORT	BENEFITS OF FSR/E TO DATE
Zambia	National coordinator, located at Central Research Station of Research Branch, Dept. of Agriculture, who liases with Directors of research and extension. Adaptive Research Planning Teams (ARPTs) are located at provincial level with liaison to national Commodity & Specialist Research Teams (CSRTs).	CIMMYT, USAID, WORLD BANK, ODA, SIDA, GOVT. of the Netherlands, NORAD & IFAD.	-100% yield improvement in sunflower in Eastern Province due to early planting. -Farmers increased bean yield several fold due to row planting and reduced seed rate in Luapula Province. -Better and earlier farmer assessment of new varieties lead to changes in CSRT plans to test varieties. -Farmer input to ARPT lead to modified on-farm trials with ridges instead of flat beds due to water logging frequency. -Negative farmer comments led to discontinuation of research on rotary jab planter. -Creation of new crop memos specific to each of three farming systems in the Eastern Province to replace the previous single crop memo for whole province. -On-farm experimental thrusts identified for specific groups of farmers. -Better understanding of why current recommendations are not widely adopted. -Improved linkages between research and extension efforts as ARPT result. -Input supply and credit decision mechanism re-geared to locally appropriate technology developed by on-farm research of ARPT.
Burkina Faso	RSP (FSR) established in 1985 as one of eight multidisciplinary priority agricultural programs within INERA, the National Research Institute of the Min. of Higher Education and Scientific Research. Informal links to Min. Agri. and Livestock at local levels but formal links only via existing Ministry links.	USAID in past (1979-86), CIRAD, IDRC, ICRISAT	-Methodology established with previous USAID/SAFGRAD project. -Initial on-farm experience with tied-ridging and fertilizer showed need to understand intrahousehold labor dynamics and "fit" of proposed technology in order to attain farmer acceptability. -New program intends to build on earlier experiences to develop farmer adapted technology; better horizontal links with commodity programs; and better vertical links between farmers, development workers and policy makers.

Senegal	PSR (FSR) and Rural Technology Transfer is a dept. within the National Ag. Res. Institute, ISRA. Four local PSR teams operate at regional research stations. PSR closely linked to Macro-Economic Analysis Bureau which enhances production-marketing-policy links. PSR dept links w/ extension via development authorities at regional level.	USAID, WORLD BANK, CIRAD	-Better criteria (eg. division of labor, proportion of rainfed vs. irrigated crops, animal traction use) used to distinguish agricultural zones in region for technology testing and development. -On-station systems trials initiated to coordinate with on-farm trials with same objectives differing only in # repetitions. -Djibelor station re-organized and enlarged to reduce 100% irrigated rice focus and include substantial rainfed research on new upland station lands as result of better identification of client farmer systems which are increasingly rainfed. -Better multi-year scientific programming due to better identification of priority farmer problems by region. -Better commodity-PSR linkages and cooperation especially with watershed team.
Tanzania	National coordinator for FSR, under Tanzania Ag. Res. Organization (TARO), who coordinates FSR Working Committees and National FSR Team which operates zonal teams which include extension officers and operate field trial teams.	USAID	-In Kilosa district, new maize variety "Kito" released early from multi-location trials due to farmer assessment and need for maize seed to overcome shortage. Widely tested and accepted via on-farm trials. -Better research-extension linkages at zonal level. -Recognition of need to link on-farm results to policy-making level.
Nigeria	National coordinator appointed in 1983. FSR is one of 9 Nationally Coordinated Research Projects. Project operated in 4 nat'l ag. res. institutes and several ag. dev. projects with coordinator of each who works with national coord. Information exchange facilitated by Nigerian National Farming Systems Research Network.	FORD F., IITA WORLD BANK, and National Govt.	Results from one project at IAR, Zaria: -Better diagnosis of farming systems using farming practices not land areas as classifying criteria. -Better linkages between FSR and commodity programs through joint presence on Research Review Committee of each program. -On-farm adaptive trials conducted to test new crop packages of commodity program before released.

Mali	DRSPR (FSR) is dept. of the Institute of Rural Economy (IER), Min. Agriculture. FSR conducted in three DRSPR projects each with different donor. Extension linkages made through local regional development organizations (CMDT-cotton; OHV-Volta River Valley Authority).	Netherlands Govt., IDRC, USAID	-Better research-extension linkages now exist especially at local sites and farmer-researcher-extensionist dialog established. -Previously held notions of homogeneity of southern zone abandonned and zones now defined using farming practice criteria. -Farmer association of maize and sorghum shown through on-farm research to be effective strategy for certain zones and is now part of research program.
Sierra Leone	FSR project lead by agronomist (Assoc. Professor at Njala University College) for limited resource farmers of Kamajei and Kowa Chiefdoms, close to Njala. Students and lecturers for small research teams. Project goals include adaptive research for improved technology, methodological development and training of student.	IDRC	-Criteria for measuring results of trials based on farmer use (eg. maize trials-fresh cob yield since farmers use fresh cob for sale and food). -Maize and sweet potato trials conducted without fertilizer because not available to farmers. New varieties must perform at least as good or better than local ones under zero fertilizer conditions. No new maize varieties could do so yet farmers desire fertilizers in order to grow maize to provide food during hungry season prior to rice harvest. Thus recommendation made to policymakers on fertilizer supply. -Plot size of on-farm trials too small for farmers to do necessary operations so farm plot size to be reduced.

and results to date. (See also Appendix 15 for supplemental case studies from Africa.) Countries with commodity-specific FSR/E and strong connections to IARCs are not included in Table 3, but some examples are the cassava-based PRONAM project in Zaire (supported by IITA), the potato programs in Rwanda, Burundi and Zaire (supported by CIP), the bean project in Rwanda (supported by CIAT), the maize projects in Burundi and Ghana (supported by IDRC and CIMMYT), and the rice project in Madagascar (supported by IRRI).

It is too soon to evaluate the relative success of these different institutional patterns. Some countries are experimenting with several alternatives simultaneously. Others, after working with one structure initially while learning to use the FSR/E methodology and relying primarily on support from outside donors, are now reorganizing to better fit the approach within the actual budgetary and management parameters of the national research and extension system. Based on our observations at present, it appears that a combination of several patterns will offer the best institutional model for African countries. This combination will likely include some type of national coordinating body, a programatic base which will cut across disciplinary units, and regionally-based adaptive research and extension teams which will interface with commodity and specialist teams having national mandates.

b) Asia. FSR/E in Asia began in the late 1960s. Today, two major systems networks operate there: the Asian Farming Systems Network (AFSN), formerly the Asian Cropping Systems Network, begun in 1975 (Hoque, 1984), and the Southeast Asian Unversities Agroecosystem Network (SUAN), begun in 1982. AFSN consists of 11 member nations, including both India and China, while SUAN consists of six agricultural universities, two each from Indonesia, Philippines, and Thailand (Mendoza, 1985). The focus of AFSN has been on flooded rice-based cropping systems research but recent efforts have included both secondary non-rice crops and upland non-paddy crops (Hoque, 1984). AFSN has facilitated annual monitoring tours of member nation's programs and has formed numerous topical working groups. SUAN focuses on human ecology/agroecosystems analysis. The key ingredient of the agroecosystems approach is the explicit consideration of long-term sustainability (Gibbs, 1985), while most FSR/E approaches have overlooked issues of sustainability to focus on immediate farmer-identified problems.

Agricultural research in Asia continues to address the problems and needs of secondary and upland crops and non-rice subsystems, including agroforestry and livestock. There is a growing realization that refinements to IRRI's traditional cropping systems methodology are needed. Asian rainfed crops, livestock and agroforestry systems are subject to much greater variability and risk than the traditional paddy rice crop. The two major Asian approaches, farming systems research and agroecosystems analysis, seem to be coming together and using some of the comparative strengths of each other's methods (FSR/E-Agroecosystems Workshop, Honolulu, Hawaii, August, 1985; Rapid Rural Appraisal Workshop, Khon Kaen, Thailand, September, 1985). Finally, Australia has considerable expertise in introducing and working with FSR/E in Asia, both within ministries and at the university level (Australian Centre for International Agricultural Research, 1985). In addition, Hawksbury College, N.S.W., (Australia) offers an approach to FSR/E in their curriculum.

Several important institutional lessons from the two Asian networks can be applied to the African situation. Just as AFSN found it necessary to have both a permanent base (at IRRI) and a network coordinator, so does WAFSRN need a permanent headquarters and coordinator. Some of the sustainability issues being examined by the SUAN network may be of methodological importance to Africa, while the experience of the six Asian universities who began this network are relevant to African universities facing similar start-up issues.

c) Latin America. FSR/E in Latin America can be traced to early cropping systems research projects in Caqueza, Colombia, in 1971 (Zandstra et al., 1979), Rio Negro, Colombia, in 1971 (Tobon C., 1985), El Salvador, in 1973 (Hildebrand and French, 1974, and CATIE, Costa Rica, in 1973 (Burgos and Navarro, 1985). The first national effort, built in part on the experience being gained in the other projects, was with the establishment of ICTA, the Guatemalan Institute of Agricultural Science and Technology, in 1973. One of the first national programs to develop and utilize farming systems methodology, the experience in Guatemala has served as a model throughout the world (McDermot and Bathrick, 1982).

During the 1970s, ICTA personnel helped create a cropping systems group in the regional network meetings of the Central American Cooperative Program for the Improvement of Food Crops (PCCMCA). The PCCMCA, along with the

USAID-funded CATIE project, helped create widespread interest in the farming systems approach throughout Central America and the Caribbean. South American countries have begun to participate in the PCCMCA network also and about half of those countries presently have farming systems projects.

Even though FSR/E has usually been associated with research and has been criticized for not integrating with extension, the farming systems project in Paraguay, supported by FSSP training, is institutionally located in the extension service rather than in research (Poey, 1985). In only two years' time, this project has flourished after beginning with an investment of only $100,000 U.S. from the USAID Mission. The CIMMYT maize program is supporting collaborative research with the FSR/E effort. Both the Guatemalan and Paraguayan experiences offer appropriate examples for African national programs to explore alternative institutional possibilities for incorporating the FSR/E approach into their national structures.

B. Evaluating FSR/E Projects

1. The Cost Issue

Before concluding that FSR/E absorbs too many financial resources, one must ask what the alternatives are. Since FSR/E depends on good, well-focused commodity (conventional) research as well as meaningful collaboration with extension, it is an approach to improve overall efficiency of research-extension systems. If one agrees with the presentation in Section I of this report, there are no alternatives.

Evaluation of cost effectiveness of FSR/E in Africa should consider how long it took reserch and extension to become cost effective in the U.S., a span of 50 to 75 years depending on the point of reference. The FSR/E approach and its application in Africa varies from over 20 years of age (Nigeria) to several months (Mauritania). USAID/Africa rapidly created a significant portfolio of FSR/E projects in the late 1970's and early 1980's. Many of these projects attempted to utilize an FSR/E approach but experienced design problems, lacked basis for evalution and lacked trained FSR/E researchers to fill technical assistance positions. Given the political, economic, biological and edaphic variability existing in Africa (Brown and Wolf, 1985) most FSR/E approaches are either too young or ill-suited to formal quantitative (conventional) evaluations. Thus it is difficult to assess the costs associated with the approach without considering the stream of benefits which will result from it.

The argument that FSR/E is too expensive was made during the first annual meeting of WAFSRN (WAFSRN Meeting, March, 1986). However, numerous participants pointed out that FSR/E has high recurrent, but low initial, costs; may be credited with several successes which are extremely difficult to quantify; and has often been asked to "quickly transform" large areas of low agricultural potential which have been ignored by traditional research and by-passed by Green Revolution innovations. Rainfed areas dominated by complex mixes of crops, livestock and/or agroforestry systems as in Africa are a case in point. Such ecologically fragile and trying situations call for very long-term research, (basic and adaptive) and extension strategies. Partly to reinforce this latter reason, USAID's recent Africa Strategy Paper calls for continued U.S. commitment to the nations of Africa and repeatedly calls for FSR/E support for at least the next 25 to 50 years (USAID, 1985a). The FSR/E approach, based upon logical and affordable incremental increases in production and/or family welfare will support African research and extension but requires long-term investments where human, institutional, financial and other resource commitments are not yet in place.

Much of the cost of FSR/E in the late 1970's and early 1980's went into USAID Africa projects which were nominal FSR/E projects. Thus, the population of projects evaluated so far is skewed by the inclusion of many first-round project evaluations from the late 1970's and early 1980's (i.e., CARDI phase I [Eastern Caribbean], HARP [Honduras], NERAD [Thailand], MFP [The Gambia], and projects in Lesotho, Malawi, and Sudan) that should not count in the evaluation process as FSR/E projects. A first attempt to classify USAID projects in Africa, according to the classes "is FSR/E" or "is not FSR/E" was recently completed by Karen Weise. (Weise, 1985). The considerable lag between design and implementation of FSR/E projects further compounds evaluation problems.

Future evaluations of FSR/E projects will be more important than those completed thus far in assessing FSR/E impact. More care has gone into design of the current USAID projects which contain FSR/E components. Many projects now are integrated agricultural research projects and acknowledge the vital roles of both conventional research and FSR/E. In these projects FSR/E assists in improving the efficiency of relevant technology generation and dissemination. Current USAID projects are also designed with input from host country counterparts, professionals and administrators. In implementation USAID, the host country governments, and contractors are more careful to staff their FSR/E project components with qualified people.

Of greatest concern currently is how to evaluate second and third generation FSR/E projects and the reduced levels of funding for future FSR/E projects. Since FSR/E complements conventional research, the resulting combination is likely to be more expensive than either alone. What is important is not the relative cost of either conventional research or FSR/E alone, but the cost effectiveness of the two complementary approaches over time in delivering consistently useful technology to farmers. Direct support to FSR/E approaches in third-world nations to ensure the long-term institutionalization of the approach is necessary. Whether a USAID project approach or direct support provided by IDRC (see Appendix 8) is best depends on the human resource base and the national environment. Four universal considerations for future evaluation are: 1) changes in attitudes of researchers and extension agents toward their farmer clients, 2) giving greater attention to farmer's needs and priorities, (3) developing meaningful working relationships with both male and female farmers, and (4) using the approach to provide a meaningful backward linkage to both traditional and biotechnology-based research systems.

2. Evaluation Processes

Conventional quantitative evaluations leave out many of the important improvements introduced by FSR/E projects such as: 1) links between project design and evaluation, 2) continuity between successive evaluations of a given FSR/E project, and 3) evaluation team composition and preparation. Links between FSR/E project design and evaluation facilitate project implementation. Many of the improvements proposed for project evaluations must be incorporated into project design and redesign. Incorporating relevant evaluation criteria is important and suggests a move from quantitative to qualitative indicators. Applications of the FSR/E approach influences attitudes of research and extension personnel by sharpening their focus on the client and broadening their perspective to include the holistic nature of farming. Measuring either quantitative or qualitative impact on attitudes is difficult. Several innovative non-traditional log frame evaluation criteria have been used successfully in projects containing the FSR/E approach or components (Farming Systems Support Project, 1985; WAFSRN Evaluation Criteria Meeting, March, 1986.)

a) Criteria. The following generally applicable criteria are recommended in designing, evaluating and re-designing FSR/E projects. (Specific criteria adaptable for a project log frame and internal self-evaluation are included in Appendix 12):

* Project impact on farmers and intermediate clients: satisfaction with involvement in the on-farm research activity, acceptability of the resulting technologies.
* Institutionalization of the FSR/E approach: management of the human resource development approach to FSR/E training, management support mechanisms to strengthen research and extension linkages, dialog between research and extension, dialog between FSR/E practitioners and national policy-makers.
* Feedback to conventional research from FSR/E communication between commodity researchers, FSR/E practitioners, and subject matter specialists.
* Impact of FSR/E on research priorities and agricultural policy and reduction of constraints of limited-resource farmers.
* Project linkage to successful negotiation of FSR/E stages by the contractor team and host country counterparts.

Continuous stakeholder dialog and negotiation between the FSR/E team, the managing Ministry or Department of the host country, and the Donor (if applicable) can assess progress with the FSR/E approach and help reach consensus on fine-tuned modifications to achieve design goals and evaluation recommendations. Continuity between successive evaluations of a given project is necessary and can be ensured by:

* Including one evaluator from the first evaluation in subsequent evaluations.
* Establishing one evaluation team for the life of the project.
* Viewing project status in terms of total project lifespan and FSR/E stages.
* Using roll-over designs, by reassessing the appropriateness of the project log frame every one to two years and modifying it as necessary.
* Including plans for an external evaluation panel in the project design.

b) Evaluators. Team composition size and preparation can influence the outcome of an evaluation more than the specific evaluation mandate given to the team, or the criteria used to conduct the evaluation itself (WAFSRN Evaluation Criteria Meeting, March, 1986). The lack of FSR/E practitioners on many USAID project design teams has meant a lack of both meaningfully-designed projects, and meaningfully-developed log frames containing relevant end of project success indicators. Some principles to consider are:

* Employ field teams with FSR/E practitioner experience.
* Use a systematic evaluation protocol document for USAID-funded FSR/E projects (FSSP Evaluation Task Force Report, forthcoming).
* Involve more senior level host country nationals.
* Encourage inter-agency evaluations of projects.
* Employ small teams for best coordination, but make them sufficient in size to understand project details in the time allocated for evaluation.
* Utilize evaluation team briefings (culture, country, project FSR/E methodology, R/E management) in all circumstances.

C. Future Directions for FSR/E

1. Priorities with Pervasive Dimensions.

While specific concerns for current and future directions in FSR/E applications, for general needs of FSR/E projects, for programs in Africa and for the important inter-household/gender considerations are discussed in subsequent sections, several priority constraints or opportunities encompass the entire problem set:

* The Role of Extension in FSR/E, while overlooked, is emerging and critical to success, not only in use, diffusion and integration of improved technology, but to the technology development process as a mechanism for mobilizing research potential.
* Sustainability is recognized as key to success of agricultural and farming systems with particular reference to human, natural and technical resource capability to sustain production and welfare and the base upon which resources and outputs rest. Sustainability must become a consistantly used criteria for judging the potential of proposed technological solutions to farmer problems.
* Crop and Livestock Integration has long been called for by many practi-

tioners. Great strides have been made in the past four years to develop and refine methodologies for conducting on-farm experimentation with livestock but these need to be further tested under farmer conditions. Animal traction technology, which intersects forage, food crop, tool, socioeconomic, animal health, and policy research has been particularly useful in fomenting developments in this area.

* Policy direction and planning is necessary, both formal and informal, to provide a base for successful integration of research and extension institutionally and in practice as well as to address those macro and micro phenomena that can help secure sustainability and linkages in support of a successful on-farm technology-generation process.

2. Shifts and Trends.

FSR/E as a mode of conducting research and extension, is in strong demand by African, Asian and Latin American countries. Countries represented at recent African conferences affirmed that brief pre/diagnostic farmer studies are essential, that FSR/E must become a mode for research and extension integration and that each country must adapt from all FSR/E methodologies and from all related approaches to fit their specific needs. (World Bank, Ivory Coast, February 1985; CIMMYT, Lesotho, November 1985; CIMMYT/FSSP, Egerton College, Kenya, August 1984; West African Farming Systems Research Network, Senegal, March 1986).

Shifting from project to program FSR/E emphasis by USAID is emerging in Africa, as has been accomplished in Asia and Latin America. National program coordination, now emerging and unique to each country, is concomitant with and essential to program emphasis in implementing FSR/E. Long range benefits of FSR/E will be optimized by incorporation of the approach through national programs supported by the IARCs. National program networking while serving FSR/E early as the vehicle for "constructive conflict" (Rhoades and Booth, 1982) and successful consensus building, now is serving more as a mechanism for the exchange of experiences in institutionalization of the approach in national systems and the exchange of results of on-farm experimentation. Networking has been primarily among researchers. However, there is increasing involvement of extension workers, development agents, administrators and university faculty which indicates project to program emphasis.

3. General Recommendations for Programs With an FSR/E Perspective.

Farmers, researchers, extension workers and policy makers must interact not only in FSR/E diagnosis and testing phases, but should interact throughout the entire research process, including trial design and redesign (Chambers and Ghildyal, 1985; Chambers and Jiggins, 1986; Galt, 1985b; Rhoades and Booth, 1982). All must understand the scope of on-farm programs and farmer participation as the basis for feedback to the research system; enhancing the capability of the extension system to transfer and fine-tune recommendations (ICRISAT Summary statement, 1986; CIMMYT, 1984); and strengthening policy support to farmer-national linkages. Internal networking is essential among researchers and extension workers such as the highly successful exchanges now beginning in Nigeria, Senegal, Togo and Rwanda as a basis for establishing regional and national program priorities.

Inclusion of inter-and intra-household, gender and non-farm employment issues as necessary to successful FSR/E is expanding and should be given further attention. These parameters, as indicated by country level FSR/E projects (Indonesia, Philippines, Burkina Faso, Kenya, Colombia, Zambia and Malawi) influence success of the technology innovation process. Further understanding of this influence is essential for improved research and extension and for policy making to serve agricultural sector goals and farm family needs. Appendix 11 briefly discusses methodological experience and needs relative to the family in the farming system.

Documentation of FSR/E results, besides philosophy, concepts and definitions, entails growing attention to methodological improvement and the process of institutionalization. Relatively little systematic reporting of FSR/E results for policymaking and planning has been accomplished. There are good examples of the impact of FSR/E on the process of generating acceptable farmer technology that need to be synthesized and shared at regional and national levels. Better reporting of FSR/E results will also yield methodological improvements in the design and analysis of on-farm experiments (livestock and crop-systems) and techniques for monitoring the impact (household, nutritional status, natural environment, production, welfare of new technology.)

Institutionalization of FSR/E as a goal should be larger than FSR/E projects or programs, for it is the farming systems perspective which needs to be captured within the institutions. A client participatory adaptive research and extension mode is the framework for the future of this perspective.

4. Specific Recommendations for Projects with FSR/E Components

- Training of professionals in FSR/E and team-building is essential both in general and tailored to national needs, at all levels. Existing efforts to provide short course training and training materials through FSSP and collaborators as well as university courses should be expanded.
- Methodological innovation in FSR/E, in FSR/E-conventional research linkages, and in conventional research, are all essential.
- Systematic farm-level records must be kept.
- Documentation of FSR/E results and team-building experiences is necessary.
- Program information must be regularly shared within the country and with other countries through formalized practitioner information exchanges.
- Improved collaboration among IARCs must continue, in sharing information on methods, coordinating work with national programs, and joint training.
- FSR/E programs must encourage participation of other groups such as Peace Corps Volunteers, graduate students ready to undertake field research, and Private Voluntary Organizations.

5. Recommendations for FSR/E in Africa

Drawing largely upon the thinking of Norman, Collinson, Baker, Abalu, Chiduza, Rukuni, Zandstra, Chambers and Jiggins, the following issues are reemphasized as critical for successful research and extension in Africa.

- Donor-funded FSR/E programs should fund institution-building and FSR/E institutionalization at the program level.
- Human resource development through practical training (field-level, in-service, hands-on, short-course/workshop) and a national FSR/E training strategy is essential to further FSR/E development.
- Institutionalization of training within local institutions through training of trainers, development of support materials, network communication and continuing education efforts must be accomplished.
- National FSR/E strategies are necessary to provide the means for unified national coordination of donor financing and enforce convergence of donor objectives with national goals.

* FSR/E in national settings must add a macro-perspective to the predominant micro-orientation by citing results from on-farm testing of technologies to further the case for policy modifications in support systems.
* Linkages between research and extension, largely informal at present must occur institutionally and at the farm level, with researchers and regional extension workers being linked through farmer groups in villages.
* Researchers must acknowledge farmers as colleagues as well as clients for improved technology through farmer participation in reviewing research designs, revealing farmer-designed trials, monitoring and evaluating the results of trials, and setting research priorities.
* FSR/E must continuously clarify its collective role with conventional and commodity research.

III . POLICY AND INSTITUTIONAL IMPLICATIONS

A. Relationship Between FSR/E and Single-Commodity Research Programs

1. What Are The Linkages?

The vital complementary relationship between FSR/E and commodity programs has been emphasized throughout this report. Currently within USAID there is a move to return to more intensive research on commodities, especially those of greatest dietary import to Africans (eg. maize, millet, sorghum, certain legumes, and cassava). This will, by the sheer size of the effort required, demand more, not less, tailored, farm-level testing of technologies and interventions. Such testing will not be simply trials, with and without fertilizer, in sole crops. Instead, farm-level trials will have to take into account constraints such as traditional and/or low-cost innovative types of land preparation, low- or no-cost inputs, predominant cropping combinations, systematic nutrient recycling, and gender and familial support of the primary cultivator of major target crop/livestock combinations, all as integral parts of trial design efforts. For this reason, it is essential that an FSR/E approach be used to improve specific commodity production.

Norman and Collinson (1985) differentiate between FSR/E "in the small" and "with a pre-determined focus" (Appendix 3). The latter refers most frequently to a pre-determined focus on a specific commodity. Most IARC efforts fall into this category due to their mainly crop-centered mandates. There are some natural linkages between single commodity research and FSR/E. First, both involve multiple disciplines, often engaged in team efforts. Commodity research, however, rarely includes social sciences unless it is conducted with a farming systems perspective. Because commodity research is often includes multi-locational trials, the incorporation of on-farm experiments with varying levels of farmer management can occur with less difficulty than in agricultural research programs that are strictly discipline-based. Adding the farming systems perspective to a single commodity program can be accomplished more easily than trying to make vast institutional changes across all programs at once. Adding one or two people is less disruptive than creating whole new programs. Norman and Collinson (1986) refer to the introduction of FSR/E through a commodity program as "driving a narrow wedge into agricultural bureaucracies" from which to build up to capacity to apply a systems perspective and then "open the wedge" to forge necessary linkages accoss commodities, components and other programs. Though this strategy has been highly successful in getting a systems perspective introduced in various regions, it is criticized because progress in opening the wedge has been slow, and involvement of extension, attention to livestock and consideration of secondary and horticultural crops or postharvest problems has been poor.

2. How Effective Are These Linkages?

Vertical linkages for commodity programs are rather good. The qualified exception is that though specific recommendations are made for extension to transfer, there is little integration of these recommendations or technologies with other farming activities. Low-resource farmers do not practice single commodity production, but rather intergrated production, and therefore need recommendations for integrated systems. Even when operating in a farming systems perspective, too often there has been little linkage across various commodities, and the onus of integration is left by default to extension. Frequently, there is also conflict between commodity programs, especially if there are donor or outside agencies involved. Resolution of this conflict among donors is crucial if their support to national research and extension programs that employ the FSR/E approach is to be effective. Recent efforts demonstrate that this is possible (CIMMYT, 1984; ICRISAT, 1986). Norman and Collinson (1986) state that the "predetermined focus" approach to commodity programs has several disadvantages such as:

* Focusing attention away from more crucial farmers problems and objectives.
* Reducing the ability to rank problems across commodities in order to appropriate allocatation of resources.
* Creating a great potential for overlap between commodity programs.
* Making linkages with extension more difficult.
* Emphasizing systems perspective conflicts with peer-group recognition among specialized researchers in commodity programs.

3. How Can They Be Improved?

Though the "with a predetermined focus" can help national programs to rapidly get moving with on-farm research, as Norman and Collinson (1986) point out, the disadvantages listed above suggest that opting for a "in the small" approach might have greater benefits in the long run. This choice will facilitate a holistic view of priority problems in the system and allow better allocation of resources towards their solution. Overlapping activities of several commodity teams doing on-farm research in a single area can be avoided and greater linkages with extension will be achieved more naturally. This route can also diffuse some of the destructive results of disciplinary-based peer group pressure.

Many countries, such as Zambia and Malawi, are integrating adaptive research teams to conduct FSR/E in specific regions or areas and linking these to commodity research teams through the coordination unit. This model seems to be effective in integrating the two needs in complementary fashion. Greater difficulties arise when FSR/E is housed in a department that is parallel and competative for scarce resources with disciplinary or commodity based departments. One specific measure to enhance collaboration and linkages within any model is the joint elaboration and review of annual workplans and explicit delineation of responsibilities and supporting budget. Here FSR/E and commodity programs can be collaborative and not hierarchical by providing service each to the other.

Commodity research teams can improve FSR/E teams by providing expertise on specifics in the diagnosis of problems, advise on appropriate designs for on-farm trials, and assist with the biological interpretation of results. Baker and Norman (1986) give five functions with which FSR/E can support conventional research and improve linkages between the two:

* Define the environmental situation of farms, how it differs from that of the experiment station, and how to assess the underlying variabilities.
* Advise on appropriate experimental levels, such as fertilizer or seed, or even endogenous variables, such as household labor availability.
* Define experimental and non-experimental variables.
* Define the farmer evaluation criteria for trials ("yield per what?").
* Conduct the "incrementalization" of packages to allow for step-wise learning and ultimately, adoption.

FSR/E can help commodity programs more fully exploit the flexibility of a system as well as remove constraints. Since long-term success depends on removing constraints, FSR/E provides commodity programs with a "step by step approach evolving away from the present system towards a new one---each step being one that is acceptable to farmers" (Norman and Collinson, 1985).

B. Most Productive Mix of FSR/E and Conventional Approaches

Providing improved technology which is acceptable to farmers is the most effective way to improve farmers' conditions, and is the ultimate goal of good agricultural research and extension. Conventional research and extension has experienced limited success in providing usable technology to limited-resource farmers (see Section I, B). Current attempts to improve on conventional research and extension have spawned other techniques and methodologies such as biotechnology and the training and visit (T&V)system.

Biotechnology is a major new research technique which utilizes genetic engineering of plants and animals with a goal of producing genetically superior species. Access to existing germ plasm that contains many valuable traits depends upon contacts within the world-based research and extension community. The research capability available through biotechnology demands better integration of adaptive research and extension efforts than heretofore experienced even in the most developed agricultural systems. While expanding basic research capability, the new techniques of biotechnology are dependent upon an adaptive research system to help transform the scientific results to farmer accepted technology. New material must be screened for environmental impact and for survival under laboratory, experiment station, and finally "real" farm conditions before being considered as an adoptable technology.

The Training and Visit (T&V) system was introduced in the 1970s by the World Bank in an attempt to make the transfer portion of technology innovation more efficient (Benor et al., 1984). One of the initial assumptions of T&V is that on-shelf agricultural technology exists for immediate extension to receptive farmers. In exceptional cases, such as India, where a tremendous backlog of relevant agricultural technology could be extended immediately to farmers, T&V has tended to work well. West African nations, which are more representative of third world countries' situations, often have little on-shelf technology to extend to their farm populations.

As noted earlier, biotechnology and T&V are sometimes posed as new models for agricultural research and extension. Neither propose significant changes in the conventional strategy, merely refinements of specific aspects. Biotechnology addresses research in terms of speeding up the conventional process of crop or animal improvement while T&V addresses inefficiencies in extension. Because FSR/E addresses the linkage of farmers, researchers, and extensionists and proposes a shift in the conventional paradigm for identifying research priorities and handling research and extension methods, it presents a contrast to the conventional approach. However, as discussed in Section I, it is a complementary paradigm and represents an evolutionary shift in the conventional approach; one which promises to enhance both efficiency and effectiveness.

Conventional agricultural research and extension is commodity-centered and discipline driven. Conventional research is often carried out in isolation from extension and farmers themselves, leading often to irrelevant and unuseable research results. FSR/E is interdisciplinary and based on farmer-participatory adaptive research and extension. It is built on the premise that research must be based on the needs of the farmers and technology must be tested under farmer conditions. The assumption that on-shelf technology exists for immediate extension contradicts the adaptive concern of the FSR/E approach. FSR/E emerged precisely because few, if any technological advances developed by conventional research in many third world nations were relevant for limited resource farmers.

FSR/E can assist conventional agricultural research and extension and increase its impact on limited resource agriculturalists in two basic areas: identifying problems considered to be most important by relatively homogeneous groups of farmer clientele, and providing a mechanism to accelerate the development and release of appropriate technology to these groups. By integrating the FSR/E approach, conventional research and extension will be more relevant for limited resource farmers.

C. Suggested Policies to Enhance the Mix of FSR/E and Conventional Approaches

The question facing policy makers today is how to optimize the benefits of agricultural research and extension for limited resource farmers? Policies and institutions must address the interdependencies of the approaches to ensure maximum benefits to limited resource farmers and achievement of agricultural sector goals. Optimal blending of approaches to agricultural research and extension will result in minimizing separateness of the research and extension functions. Policies influence and are influenced by institutions; both have an impact on approaches utilized in implementation of programs to achieve goals. Consistency among agricultural policies, institutions, approaches, and goals, while essential for agricultural development may be difficult to achieve and maintain.

Policies that are conducive to successful technology innovation and can help institutions deliver acceptable and useful technologies in a timely manner are listed below:

* Research priorities must be based on identified needs of farmers.
* Research and extension institutions must allow internal reorganization which would be conducive to the development of field teams, setting priorities, national coordination, and building prescriptive linkages at various levels. This reorganization does not have to preceed any FSR/E activity, and in fact may result as a demand for FSR/E grows among convinced practitioners.
* The role of extension has to be redefined giving extension the right to play a more active role in determining research priorities, engaging in on-farm experimentation, and monitoring impact of new technology.
* Social and economic sciences need to be brought into research and extension at the coordination level, and mechanisms must be developed to extend their respective methodological input to field teams even where trained social scientists are not available.
* Entities engaged in FSR/E must have adequate mobility in terms of transportation.
* Institutions must have flexibility in funding and decentralized sources of funding to accomodate activities.
* In order that the above policies can be implemented and FSR/E can be institutionalized, FSR/E practitioners must begin to modify and adjust FSR/E methods to fit both national program needs and their logistical and management parameters.

FSR/E practitioners must be collectively more innovative in the entire technology development and delivery process. More is needed than reports to commodity researchers of problems identified by farmers or calling for researcher assistance in designing trials to address these problems. Various farmer-back-to-farmer approaches suggest new research and linkage opportunties (Chambers and Ghildyal, 1985; Chambers and Jiggins, 1985; Rhoades and Potts, 1985; Richards, 1985). FSR/E practitioners must assist component researchers in making more direct farmer linkages.

D. An Economic Evaluation of FSR/E: Qualitative and Quantitative Comparisons of FSR/E and Conventional Approaches

1. Level of Evaluation

The question of economic viability for research and extension programs that utuilize a farming systems approach to technology generation and transfer engenders both confusion and limited response. Confusion because of lack of agreement and specificity about what is to be evaluated and a limited response because the approach is very new as research and extension efforts go. Considering three levels of economic evaluation may reduce confusion: the FSR/E program, FSR/E project and technology resulting from FSR/E applications.

Economic viability at the program level must consider FSR/E contributions to overall extension, research and policy efforts within the agricultural sector. As discussed in Section I, only recently have donors and national governments begun to address the issue. Recognition of the important linkage potentials adaptive research and extension efforts have prompted USAID/Africa and World Bank to emphasize FSR/E. Economic parameters for analysis are potentially numerous but usually relate to national sectoral and institutional goals of production, consumption, resource use and welfare.

At the FSR/E project level economic viability assumes a different but related posture to that of program viability. As discussed in Section II of this document, solid evidence from project evaluations of the impact attributable to FSR/E is lacking because of various project design problems, lack of adequate baseline data, and lack of sufficient time for the project to achieve results. Intermediate indicators, while often not economic in nature, do suggest progress through projects that utilize the FSR/E perspective toward achievement of goals by farmers and their supporting research and extension institutions. Attitudes of researchers and extension workers toward farmers (male and female) have changed giving greater emphasis to farmer needs and priorities and their feedback to the technology innovation process. Project level recognition of the economic role of women in food production and distribution itself signals major shifts in needed economic analysis. This analysis is only beginning to take form.

Of most concern to research and extension practitioners and their collaborating farmer clients is economic evaluation of technologies. While such analysis should be better understood, adaptions of conventional production and farm management economics to FSR/E needs are relatively new and incomplete (FSSP Training Units, forthcoming; CIMMYT Economic Analysis Handbook, 1985). General goals of the analysis are to analyze results of on-farm trials, differences in biological and economic optimums and a whole farm perspective as it influences technology. Criteria must recognize household goals, risk factors, enterprise alternatives, management and labor time, cash returns and others based upon the farmer's perspective. Functional analytical approaches to delivering timely and useful economic information must account for fundamental economic concepts constrained by practical data and measurement realities where partial budgeting, dominance analysis, graphing, response surface and modified stability analysis may be sufficient and adequate. Many projects and their resulting technologies are only now ready for such analysis. Similarly adapted measurement techniques are presently emerging in training literature for practitioners.

2. Farmer Acceptance and Returns

During the Green Revolution years of the early and mid 1960s, conventional agricultural wisdom held that for an improvement to be accepted by farmers it should result in a 50-100% increase in farmers production (Mosher, 1966). Others argued that the absolute increase in potential yield was more important than the percentage increase (Schultz, 1964). Today it is widely accepted that farmers, as rational decision-makers, will accept and adopt technologies which 1) improve their system under their particular agro-climatical, biological and socio-cultural conditions, 2) do not significantly alter the risk balance of the particular component (crop or animal) and the system, and 3) are either cost-free or of very low-cost. A technology that increases yields by 10%, if such a 10% increase is considered crucial to the household by the farmer, will be adopted before an improvement that increases yields by 50-100% at the provincial experiment station, but cannot be shown to do likewise under typical farmer conditions, or, alternatively increases price and/or production risk to an unacceptable level in the eyes of the farmers.

While quantitative indicators are troublesome in measuring research impact because of time, base and imputation constraints, another alternative approach to evaluating a technology development process is by evaluating farmer acceptance. This provides both a measure of success for a technology and for the institutional configuration that generates that technology. Acceptance ratios can be applied to technology adapted for extension and to all technologies evolving from the basic research arena that ultimately become acceptable. Higher use and acceptance ratios can be achieved when client needs are best understood within their bio-physical and socio-cultural environments. Imposition of acceptance ratios to the exclusion of all other considerations, however, can be detrimental. Basic exploratory research directed toward major farm level constraints is essential and always accompanied by certain failures in laboratories and on experiment stations. This is an important purpose of research, and reduces adaptive on-farm research costs. Thus, the balance is between basic and adaptive research needs both in terms of technology development costs and technology acceptance ratios.

3. National Returns

Success can be specified in specfic constraint and commodity cases. Not all applications of FSR/E methodology will appreciably influence national production. Some, for example, will help small groups of people which in turn, and in the long run, may improve the health of the agricultural sector. Measuring returns to research and extension through technological interventions for small and widely diverse farm household applications is more complex than for large farms where package technologies are more readily adopted. While it is much easier to measure 50-100% increases in a "tech-pack" approach applied to fields of a few large landholders, or on plantations, where conditions are quite similar to those encountered on an experiment station, it is much more difficult to identify and measure increases on numerous small farms when the agronomic or livestock increase may be limited to 10-15% over a three to five year period.

Since FSR/E usually is applied to existing research and extension systems, the approach is not an alternative to the system but a complement and its value is determined at the margin where the overall research impact is measured. Quantitative measurement of returns to national agricultural research investments is difficult at best. Where a research and extension system is completely reorganized or initially established around an FSR/E approach, measurement is more direct but even then comparisons with conventional approaches have major time and location limitations. Two examples of such reorganization include ICTA in Guatemala (ICTA, 1985), and Lesotho in 1980.

4. The Time Frame for Evaluating Returns

While most agree that successful agricultural technology development requires major time investments, fewer agree on what is an acceptable amount of time to wait for significant results and what constitutes significant results. Donors and host country policy-makers of the late 1970s and early 1980s rushed to establish the FSR/E approach. Some acknowledged that even though the FSR/E approach appeared to be efficient, it would nevertheless take many years to produce tangible results. Biological and instititional reality suggest that the impact of FSR/E on research and extension performance is a 10-25 year phenomenon, yet political reality reveals impatience because major breakthroughs have not resulted from 4-6 year investments.

Acceptable time for development and application of agricultural technology also depends upon the client. Donors consider time and monetary trade-offs, while farmers deal primarily with time, risk and family welfare. Time, as a substitute for, or complement to, other resources, is considered differently along the client spectrum from donor to farmer. For the farm family at the edge of starvation time interacts closely with risk. While no improved technology may mean death in the medium or long-run, the risk of technological failure can mean death in the short-run also. Relatively minor, but risk free, technological changes at the margin are more acceptable to most low-resource farm families while major high yielding breakthroughs that overlook occasional but complete failures, have had greater institutional appeal.

The time required to achieve either the immediate term goals of a farm family or the long term goals of donor agencies depends on the knowledge base of the research system. This base varies greatly by agro-climatic zone, political unit, socio-cultural system and crop. Ownership of this knowledge is shared by farmers and research institutions. Any rule of thumb for cost and time evaluation of technology development must be complex and site specific. However, research and development resources and time are limited for low-resource farm families, so every attempt must be made to evaluate and refine research and extension systems to make best use of time and resources.

Evidence of past experience is interesting, and testifies to the value of research, but helps little with finite investment decisions. This experience reveals that many years are required for agricultural research to produce sustained agricultural development. Since the classical measurement of returns to agricultural research was carried out several decades ago (Griliches, 1957; Griliches, 1958), many others have measured or attempted to measure such returns (Evenson, et al., 1979; Ruttan, 1982). One reference lists an annual rate of return to research of between 74-102% (Evenson and Flores, 1978). Most of these estimates are due to improvememts in Asian rice production. Between the years of 1958 and 1980, there were 33 studies of the productivity of agricultural research efforts based on the internal rate of return model, and three more based on benefit-cost analyses (Ruttan, 1982). Some 63 separate analyses were conducted. With the exceptions of research on cotton in Colombia and wheat in Bolivia, all the remaining analyses gave annual internal rates of return for research dollars spent of between 11-110% (Ruttan, 1982). The time frame for most of these time series analyses varied but generally covered many years. Given the relative youth of the FSR/E approach, it may be 10-15 years too early for analyses of the approach in given national programs.

5. Field Introductions of FSR/E and Attendant Costs

The process of introducing FSR/E has taken many forms ranging from the addition of one person to complete reorganization and addition of costly expatriate teams. While the former may require a slow process, the latter is a shock to any system and may actually hinder the process in the long run. Some feel that the more rational approach to the introduction of FSR/E is to start small and build up within the system, allowing for substantial training and enhancing the national capabilities to manage FSR/E from the start (Stoop, 1985). This approach is more similar to the philosophy of IDRC than to other donors. For many national programs, particularly in Africa, the lack of a large cadre of trained professionals sometimes makes a large, externally funded and externally staffed projects seem the optimal route. Stoop recommends national leaders to

> adopt a policy which gradually introduces on-farm research and a systems perspective, rather than to create large and separate, externally-funded "Farming Systems" units, which are not integrated into the existing research structures, and which generally rely on short-term, external funding...such projects often lead to further "fragmentation" of the national research effort, while, when foreign funding is exhausted, the projects are often discontinued because of a lack of local funds (Stoop, 1985).

A major constraint in attempting to follow the "start small" approach is that in most cases, donor funding is needed, and not all donors have the capacity to start small and build as needed. Large, expensive, 3-5 year projects are more popular among several major donors and this preference influences the desires of the national program in its planning. Donors need to re-assess the manner in which FSR/E is funded in national programs and how they can best support national development of the systems perspective. The thrust behind FSR/E in many parts of the world and particularly in Africa comes from outside donors. It is difficult to say whether national programs have no interest in or knowledge of FSR/E until the donors get involved, or whether initial and maintainance costs of FSR/E are too high for national research and extension systems to undertake on their own. Given that for most national agricultural research and extension systems, 90% of their budget goes to salary (Anderson and Dillon, 1985), fexible funding for programs requiring high recurrent costs and considerable mobility is limited. However, "despite strong external support, FSR/E will not become institutionalized within national agricultural research and extension systems without strong national commitment and management of the FSR/E activities" (Fresco and Poats, 1986).

While specific benefit/cost ratios cannot be calculated for FSR/E projects or for the approach in general, there are certain items and research/extension functions which will be affected financially any time FSR/E complements conventional research. The list in Table 4 is drawn mainly from experiences of the FSSP core staff, but also depends on Galt (1985b).

While these costs do not represent the actual costs nor even all of the budget categories to be considered in implementing FSR/E activities, they do give an idea of the relative costs compared to a strictly conventional

TABLE 4. List of Relative Impacts of Adding FSR/E To Conventional Research Upon Research/Extension Budget Line Items

BUDGET SOURCE (RESEARCH OR EXTENSION	BUDGET LINE ITEM	IMPACT: INCREASES (+), DECREASES (-), OR NO CHANGE (0)
Both	Training	+
Research	Non-recurrent costs (infrastructure)	-
	Recurrent costs	+
Both	Transportation (vehicles/fuel/maintenance)	+
Research	Supplies (inputs, implements, tools, paper, photocopying, etc.)	+
Research	Temporary assistance (enumerators, field trial monitors, research assistants)	+
Both	Increased research-extension contact (includes additional meetings, trips to farms, etc.)	+
Research or Extension	Human resources (permanent, line personnel)	+
	Research-extension liason officer	+
	FSR/E practitioners	+
	Assistants for on-farm diagnosis and trials	+
	Assistants for station back-up trials	+

strategy. The important consideration to factor into the equation, however, is that if FSR/E can facilitate better generation of technology appropriate to farmers needs, and the conventional system is incapable of achieving this, then the cost becomes simply the cost of success and, thus, indispensable.

6. The Bottom Line

Three major benefits to farmers from the incorporation of an FSR/E approach summarize the issue of cost effectiveness. First, because priorities are based on farmer needs, more relevant technologies are developed. Because FSR/E is designed to specifically address the needs of low-resource farmers, the resultant technologies are more likely to be acceptable to these farmers. Second, because the research to generate technology is done on-farms with farmers as cooperators, inappropriate solutions are deleted early in the process and resources are focused on appropriate ventures. Involvement of farmers in development of the technology means they will have quicker access to its use. Finally, because FSR/E is meant to be a holistic approach, and it is moving towards better incorporation of gender and household issues and methods, it offers the promise of being able to overcome many of the gender biases inherent in most other agricultural development strategies, and offers hope that all farmers, male and female, will be considered in the generation of appropriate technology.

E. Institutional Levels Dealing With FSR/E: Potential For Complementarity

Several institutional levels may employ an FSR/E approach: 1) national agricultural research programs (NARP), 2) universitites, 3) regional agricultural research centers (RARCs), 4) international agricultural research centers (IARCs), 5) USAID funded collaborative research support programs (CRSPs), 6) national agricultural extension programs, and 7) private sector initiatives including farmer associations, supplier and marketing groups, and PVOs. Each group differs in mandate or function, political base, sources of funding, degrees of autonomy, and levels of access to and identity with the ultimate clientele, the farmers. While their contribution is necessary their respective roles in FSR/E are quite different.

An organizational chart which shows the relationship of each institutional participant to the others is shown in Figure 2. The RARCs, IARCs and CRSPs all gain access to the farmers only through the national agricultural research and extension programs or, occassionally an agricultural university. National instititutions involved in the FSR/E approach are the key to successful agricultural research linkages where access of a given NARP to farmers is through the provincial and local extension services. Thus, for an innovation from any source outside of a NARP to receive widespread testing and acceptance by farmers, it must pass to the farmers through both the NARP and the national, extension administration at both the provincial and local levels. For feedback to accumulate relative to an innovation, it must return through extension to research and the initial source of the innovation.

1. Comparative Advantages of Various Institutions In Conducting FSR/E

a) National Agricultural Research Programs (NARPs). The NARPs have been receiving increased attention from the CGIAR since 1978 when the Technical Advisory Committee (TAC) issued a report critical of the way some IARCs were "using" NARP staff to meet IARC objectives which were not always the same priority as NARP objectives. The problem is insufficient resources in general for agricultural research programs. Many NARP researchers and administrators have been compelled to do research in IARC interests in order to do any research at all. An optimal mix of responsibility and resource allocations among entities in the research and extension process reveals some possible efficiencies through an FSR/E approach. But generally, there are not sufficent funds for conducting adequate research on either a global or national basis.

NARPs are in a pivotal position of drawing from international research and working with and through extension to reach farmers. How technology will be moved to the farm after its development has not been addressed traditionally by the IARCs, RARCs or CRSPs. FSR/E, utilizing the concept of research domains across national boundaries, can give direction to these linkages. International groups can help to coordinate activities in the research domains within national boundaries and in this way provide for the possibility of wider ranges of environment applicability of new technology.

All institutions working with FSR/E approaches might bring their research resources to bear within the NARP to reach the farm level system. IARC or

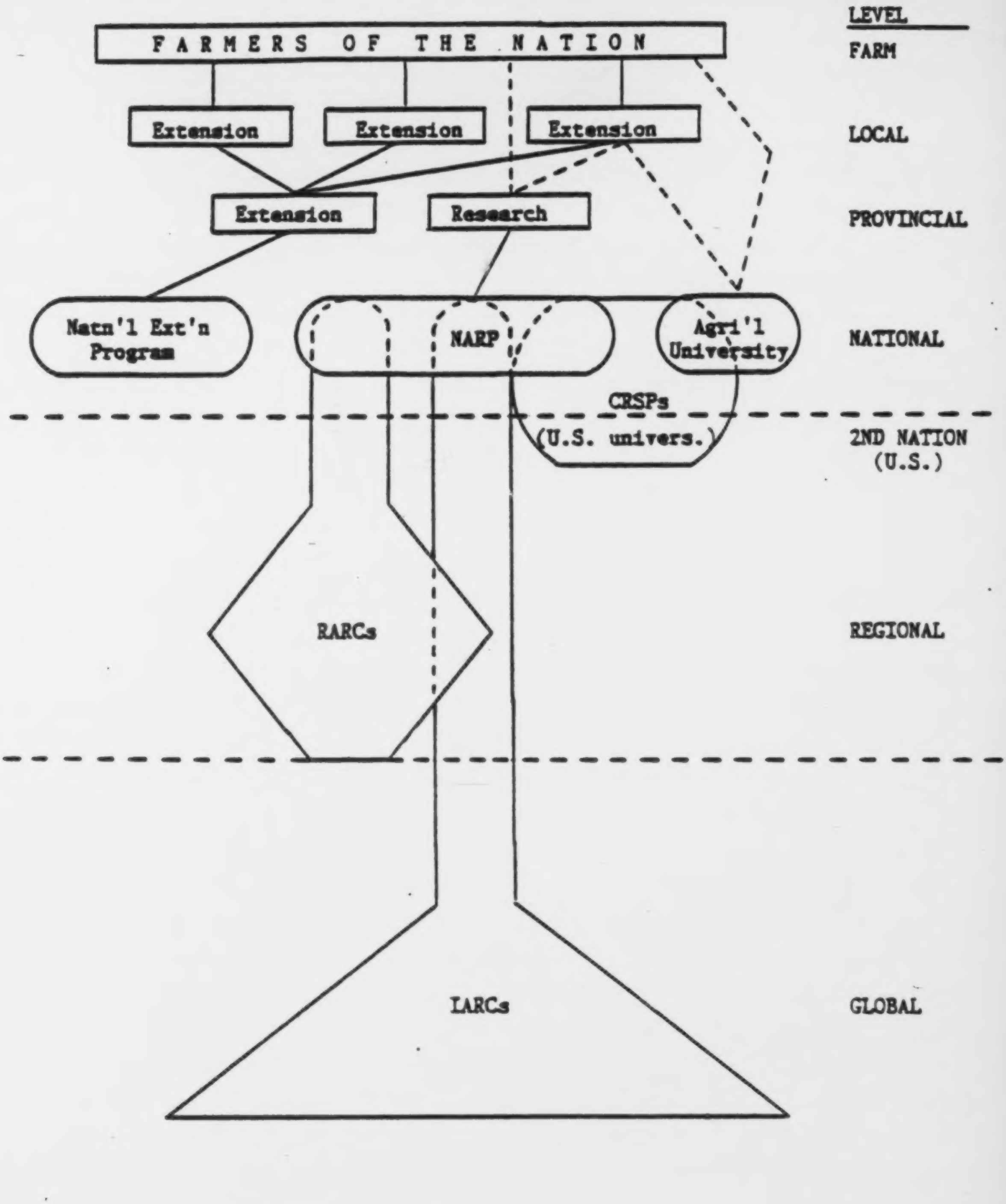

LEVEL
F A R M E R S O F T H E N A T I O N
FARM
Extension
Extension
Extension
LOCAL
Extension
Research
PROVINCIAL
Natn'l Ext'n Program
NARP
Agri'l University
NATIONAL
CRSPs
(U.S. univers.)
2ND NATION (U.S.)
RARCs
REGIONAL
IARCs
GLOBAL

Figure 2. Institutional relationships.

RARC outreach staff should be given NARP appointments, making more international experts responsible to NARPs. The role of the NARP would be directing the interaction of the IARC outreacher toward solutions of specific problems of the host country's farmers. Results will feed into international networks focusing on specific constraints defined by the broad research domain. This demands additional funds for staffing more IARC outreach personnel positions and funds for national collaborators. The largest proportional increase in professional staff employed by the IARCs has been in outreach staff, yet the need far exceeds response ability. The most successful IARC outreach staff members operating today do so in a single country setting and often at a provincial level.

b) National Agricultural University(ies). Many nations (see section II A, 4b) have significant FSR/E thrusts in agricultural universities. Such groups may or may not have significant contact with the relevant NARP or linkages with either provincial or local extension (see Figure 2, broken lines). Efforts for mutual collaboration between the university, NARP, IARCs and RARCs active in that nation should be pursued. The university, besides a source for research, also provides for methodological support through state of the art synthesis and through initial training and continuing education program support.

There are several cases around the world (eg. Thailand and Nigeria) where the university FSR/E program is several years older and more experienced than the NARP. In such cases, the university based programs should be used to train and orient the indigenous human resources necessary to extend the approach at the NARP level. Keys to this process are: 1) timing so that participants for training learn the maximum amount possible in the least amount of time, and 2) sensitivity to ongoing university programs and calendars so faculty are not overwhelmed with trainees at worst possible times.

c) Regional Agricultural Research Centers (RARCs). The purpose of IARCs and RARCs is similar: to provide support to national programs where research results either provide a basis for addressing research domains of regional proportions, or more basic science support where national programs have research resource limitations. IARC and RARC involvements reflect how well this support function is covered and the degree to which each institutional structure is necessary, complementary or duplicative. This will differ by region and subregion and possibly by crops or cropping systems.

RARCs (eg. CATIE in Central America and WARDA in West Africa), are usually quite sensitive to the needs of each host country of their region partly due to their small size relative to IARCs and that they recruit staff largely from within the region. Continued presence of RARC outreach personnel in a given country is more tenuous than that of IARC outreach staff, since RARCs usually have fewer political entrees than IARCs. The funding of RARCs is not as diverse stable and secure as that of the IARCs.

For RARCs, more emphasis is needed on continuity in farmer-based approaches to FSR/E while supporting NARPs and drawing support from the relevant IARCs in the region. The initial screening of IARC materials could be done at the home base of the RARC and/or placed under the guidance of their outreach staff. This would lessen some of the load on the NARPs while increasing the regional liaison/communication role of each RARC.

d) International Agricultural Research Centers (IARCs). The IARCs are the best-endowed organizations of the five groups with respect to both financial and human resources. IARCs are traditionally funded by a much broader base of donors than are RARCs. IARCs tend to attract not only highly professional and competent scientific staffs, but also are usually considered one of the most desirable places of employment for nationals. Further investments at national levels are necessary to strengthen the research and extension pool in quantity and quality with renumeration commensurate with the important task before them. The precedent for greater support to NARPs exists where some IARC outreach staff members work as "employees" of NARPs addressing a mutually shared priority research problem.

IARCs must balance time and resource allocation between support to research priorities of given NARPs and to their own mandate of providing improved germplasm. Some believe that the IARCs, as guardians of international germplasm, should become more sensitive to the needs of NARPs for the use of such germplasm (Witt, 1985). Genetic needs for crops X and Y to serve a client concern must dictate research needs where joint ownership of results can strengthen applicability within the research resource capabilities of

NARPs and IARCs. Several have written on this subject (see Witt, 1985), indicating that NARPs are anxious to achieve greater benefit from these international germ plasm collections through stronger institutional linkages and improved constraint identification and resolution processes.

e) Collaborative Research Support Programs (CRSPs). Establishment of the CRSPs and related research policies evolved to address several commodity and program research support areas not covered by the IARCs. The CRSPs, as a creation of Title XII, provide a method for tapping the research support base within the U.S. university community. As the CRSPs mature, commodity and functional networks of scientists are emerging in collaboration with IARCs and with other USAID projects. The farming systems program area is one point of interface among CRSPs, IARCs and USAID bilateral contracts. Further maturity and coordination through farming systems methodologies will lead to stronger linkages along the research spectrum from basic to adaptive.

f) National Agricultural Extension Programs. National extension programs in Africa differ greatly in quality and structure. Effectiveness relative to technology transfer depends on quality of the linkage between the extension program and research. In some instances, particularly where an FSR/E approach is applied, the research and extension linkage is emerging on a potentially sound base. The greatest concerns to many agricultural sector leaders with extension programs are:

* Continuing education for extension personnel which often suggests personnel reductions coupled with better on-going training and support.
* Extension methods and structures that apply key communication principles such as those addressed by T&V;
* Message deficiencies, a problem for T&V, which demand improved linkages with research programs for development of appropriate technology.
* Capability to work with both age and gender needs in extension of technologies and information for women, children and the elderly who have the greatest impact on food production in Africa and much of the third world.

Often policy issues related to extension institutions are not conducive to effective technology transfer because extension serves as a political arm of the government or simply an employment agency. Furthermore, extension may be so burdened with other activities that the technology development and transfer role is not served.

g) Private Sector Firms: Farmer, Supplier and Marketing Groups. Farmers are both participants and clients in the technology development process. They provide the ultimate test of technology by using or not to using it. But in a farmer participatory FSR/E program, active involvement comes both at diagnosis and on-farm testing. Farm level institutions such as input supply groups and marketing entities round out the infrastructural base that influences the farmer as a manager of new technology.

Differentiation of the "farmer on-farm research participant" from the "farmer client" is subtle but critical. Utilization of farm level expertise in testing and diffusion is essential to successful work by research and extension institutions. Until the institutional dimension of farming is given equal berth with the other institutions discussed herein, many will continue to consider the farmer as a passive client.

2. Ensuring Complementarity Between Institutional Levels and Approaches

Inter-institutional complementarity among NARPs, RARCs, IARCs and CRSPs might be assured by fostering a simple, common and agreeable clientele hierarchy as the agricultural research and extension focus. IARC representatives have advanced collaboration with a common definition of FSR recently at a meeting in ICRISAT, Hyderabad, India (ICRISAT, 1986). As this agreement is operationalized, the amount of appropriate technology generated for the benefit and use of resource-poor farmers of the third world should be augmented.

In Figure 2, farmers were intentionally placed on top as the ultimate (i.e., most important) clients of both agricultural research and extension activities. Local extension, provincial research and extension, and the national research and extension programs are between farmers and international donors and regional and international research centers. Access to farmers of any nation is first through local extension, then through provincial research and extension to which national research and extension have immediate access. The role of RARCs, IARCs and CRSPs, therefore, is best in support of NARPs.

To assure complementarity among conventional, FSR/E and biotechnology approaches overall direction should originate around NARP needs, with RARCs, IARCs, and CRSPs serving those needs. Representatives of various approaches should understand the financial and human resource constraints under which each NARP operates. Practitioners of FSR/E would obviously wish to see a bigger part of the research fund pie devoted to FSR/E activities. But, if such a move cuts out an essential part of conventional commodity research, another alternative should be considered unless the commodity research is totally ineffective. Likewise, if the budget does not allow the addition of a significant biotechnology component to a NARP without diverting monies from pilot, or initial, FSR/E areas, or by cutting out necessary conventional research, serious thought should be given to accessing new sources of germplasm elsewhere such as using RARCs, IARCs, and CRSPs and neighboring countries.

Another key to complementarity is for the relevant RARCs, IARCs and CRSPs to take simultaneous note of the priorities, needs and thrusts of any given NARP. One mechanism to facilitate such coordination is a national planning session with all involved RARCs, IARCs, CRSPs and donors. Such a session should also involve extension, at least at the national and provincial level. There would be at least three major goals of the planning session: 1) to modify past research approaches by incorporating a better strategy to address the needs of low-resource farmers while maintaining or building a strong conventional research program focused on resource-independent technology generation; 2) to outline the commitment of the host government for funding agricultural research and extension in the immediate future; and 3) to allow an opportunity for the host government and donors to determine acceptable and compatible agendas of supplementary funding needs, and parcel them out to various donors for financing.

3. Ensuring the Research Benefits Accrue to Low-Resource Producers

While it is difficult to be sure that benefits of any given agricultural research approach accrue to limited-resource farmers, it is easier to predict that many more will if research and extension focus more systematically on this clientele. For this reason, any approach which focuses on farmer participation and problems is bound to have impact at the farm level for that category of producers. While some FSR/E proponents and practitioners have been cast as zealots with a missionary spirit and unwilling to compromise their ideals and approaches, most current FSR/E practitioners are not concerned with the label applied to what they do. The concept of farmer-based and farmer-relevant interdisciplinary research and extension is what matters. As in any evolving approach, methods and applications are under careful scrutiny and debated at length. However, consensus is evolving quickly and productive improvements in method are emerging regularly. For the longer run, FSR/E as a label will be subsumed under a restrengthened, commodity based, systematic approach to research and extension. This, however, will be a modified neo-classical research and extension system.

In those third world countries where the majority of the farmers possess very limited resources, such an approach will normally focus on solutions of their problems. Any movement toward a combined approach, which uses the rapid reconnaissance survey to begin the process, will at least be assured of identifying a range of relevant problems on which to focus research and policy efforts. The success of such approaches will depend highly variable biologic, economic and socio-cultural factors and varied political and human elements comprising the different organizations and institutions involved in agricultural research and extension processes.

APPENDIX 1

DESCRIPTION OF THE FSR/E STAGES

Diagnosis usually consists of two steps. The first is an inventory of relevant secondary literature, agricultural production systems, existing research results and recommendations, input delivery structures, and other infrastructure in the project area. The second is the determination of needs and production constraints or problems for defined groups or domains of farmers. The process of defining groups of farms or domains (Harrington and Tripp, 1984) is called targeting. "Although the concept of targeting might seem contrary to the recognition of heterogeneity among farms, it is an essential component of the FSR/E approach. It is not practical to conduct research tailored specifically to a few individual farmers. On the other hand, research carried out for farmers in general is unlikely to produce technologies which are appropriate to all the varied types of farming systems present" (Wotowiec et al., 1986).

Recently, it has been suggested that FSR/E practitioners progressively categorize and target farmers and farms progressively into three types of domains, which differ functionally (Wotowiec et al., 1986). Research domains target for variability and consist of a problem-focused environmental range where hypothesized solutions to a defined problem could be applicable and should be tested (Wotowiec et al., 1986). Recommendation domains are homogeneous groups of farmers within the research domain who should be able to use a common technology. They are defined according to the response of a specific technology to the real agrosocioeconomic conditions found on farms in the research domain. Experiments located on farms then serve the dual role of experiential and informational learning (Hildebrand, 1985). These two aspects of the extension function are carried out more efficiently when OFR is targeted into existing diffusion domains. Diffusion domains are interpersonal communication networks through which newly acquired knowledge of agricultural technologies naturally flows. While farmers involved in research on their own land are benefiting from experiential learning, others in the diffusion network benefit from informational learning (Wotowiec et al., 1986).

In diagnosis, various methods of informal, formal, quantitative and qualitative data collection are used. The procedure developed in Central America known as the sondeo (Hildebrand, 1981), or the rapid rural appraisal (Chambers, 1981) are effective diagnostic tools that may be used to define domains and identify problems. In some areas, domains are not easily distinguished initially, and definitions are refined as OFR progresses. Diagnosis has often included more formalized surveys for data gathering; however, the trend is toward informal methods with complementary and focused formal surveys to verify informal results or to explore in greater detail some particular aspect of the farming system. Diagnosis does not take place only at the start of FSR/E work, but is continually carried out to monitor on-farm experimentation, gather new information, conduct evaluations, assess impact, or generate new research directions (Galt, 1985b).

In the design stage, the problems identified in diagnosis are prioritized, often using a process called "ex-ante analysis" (Mutsaers, 1984). Strategies are then developed to overcome the priority problems, and an OFR program is designed using farmer collaborators selected from the appropriate research domain. Often on-station experiments are also designed in order to research problems identified during diagnosis for which no immediate potential solutions are available for testing on-farm. FSR/E, in principle, introduces changes only at the farm level. Since food production is often constrained by factors at other levels, such as transportation systems or pricing structures, the design step can include referrals of identified problems to other research or development agencies, or to the appropriate government ministry or bureau.

Following design, the testing, monitoring, verification and evaluation of proposed innovations are conducted in farmers' fields with varying levels of supervision from researchers or extension agents, or both, and under varying levels of farmer management and evaluation. Farm-level trials can be classified in two distinct ways, by function, and management. The function of a trial relates to its purpose in the FSR/E process. There are three types of functional trials. (1) Exploratory trials, at the beginning of the process, are "conducted when little is known about the domain or about possible treatment effects in the domain" (Caldwell, 1986). (2) Refinement trials follow exploratory trials and usually precede validation trials. They may be either site-specific (similar to exploratory but including fewer treatments) or regional (bringing together the best of the site-specific treatments across the research domain). At the refinement stage, socioeconomic analysis is added to agronomic analysis (Caldwell, 1986). (3) Validation trials follow refinement trials and directly precede demonstration trials. These trials contain one or at most two interventions in large, unreplicated plots, compared quite simply against the farmer's normal practices.

The management of a trial relates to researcher/extension/farmer interactions with respect to control and management of the trial, from planting to harvest. Again, there are three general types of management trials. (1) Researcher-implemented, researcher-managed (RIRM) trials are arranged, planted, monitored, managed and harvested by researchers in farmer's fields. Such trials represent the most risk to farm households of any trials during the FSR/E process. Hence, most costs and risks are covered by the research organization. RIRM trials are most common during the exploratory stage, but may occur during refinement (Caldwell, 1986). (2) Researcher-implemented, farmer-managed (RIFM) trials are usually equivalent to superimposed trials. Researchers impose treatments on crops (e.g., a top-dressing of nitrogen fertilizer) already planted in farmer's fields, or on animals within a farmers herd. These types of trials are most common during exploratory or refinement stages (Caldwell, 1986). (3) Farmer-implemented, farmer-managed (FIFM) trials are common after an intervention proves to be of low risk to the farm household. FIFM trials are planted, monitored, managed and harvest by the farmer. Farmers are financially responsible for the trial and any input cost. These types of trials are most common during validation (Caldwell, 1986).

On-farm and on-station research are complementary in the FSR/E approach, with success depending on the linkages of OFR with component and commodity research. Through farmer participation, farmers provide resources to help solve their problems and become resources in the evaluation and dissemination of alternative solutions. Although all farmers normally experiment with different ideas, they are not professional researchers. Thus, research designs and technologies to be tested must be simple so that farmers will be able to manage them in the OFR process. This complements the usual farmer procedure of adopting components rather than complete (and complex) packages of technology.

The fourth stage in the FSR/E process is the dissemination of relevant results to a wider group of households in the appropriate domain via extension and communication systems. Use of diffusion domains to help locate on-farm trials and involvement of extension agents throughout the process means that there is no clear-cut time when research ends and diffusion begins. Farmers learn how to use potential solutions early in the process because research is conducted on their farms. As refinements and verification proceed, the force of diffusion increases, so when active dissemination begins to households not directly involved in on-farm testing, there is usually already a base of knowledge about the innovation among these farmers. Likewise, because extension agents are involved in the research process, they themselves have contributed to the development of the innovation and have learned how to use it. They are more confident of its utility, having worked with farmers to determine its application and success. Although many national agricultural research and extension systems (NARES) are only in the initial stages of implementing an FSR/E approach, those further along in the process show that dissemination of innovations occurs more rapidly with on-farm research due to the tested and confirmed applicability of the innovation under actual farmer conditions in the diffusion domain (e.g., see ICTA, 1985).

It is important to reiterate that the steps described above may occur cyclicly or proceed in a slightly different order (Galt, 1985b). Rhoades (1982) describes how the process can also begin with on-farm trials to facilitate the diagnosis of post-harvest problems. In other instances, a national program may be doing diagnostic work in one area while completing on-farm trials in another. Or, both may occur simultaneously in the same area when different problems are being addressed among the same farmer group. In the latter example a farmer, grouped into one domain for one identified problem, may belong to another when a different problem is being addressed. Finally, it must be emphasized that because both feedback and evaluation are emphasized at each step in the FSR/E process, ineffective technological avenues can be identified early before great amounts of money are spent, and the research effort can be redirected. This is the essence of the flexibility and iterative nature of the approach.

APPENDIX 2

CASE STUDY: UNITED STATES LAND-GRANT SYSTEM

Curiously, the Land-Grant system of the United States is probably the richest FSR/E experience that we know of. FSR/E was so deeply imbedded in the Land-Grant philosophy, up until the mid-1950's, that workers in the system never recognized it as a distinct activity separate from the general research-extension activity. It was not, however, worked into the country's massive technical assistance effort to developing countries, as will be explained later. In the "institutional drift" of the Land-Grant system toward science, of the last quarter century, the evidence is that the FSR/E approach has suffered a considerable atrophy. For these reasons there was probably no alternative but to reinvent the FSR/E wheel, in developing country technical assistance programs, and it has largely been just that, a re-invention.

The Land-Grant system was staffed almost exclusively by personnel who had grown up in the very sector the system was designed to serve, so they had a good knowledge of the farming systems. Further, they had brothers, parents, cousins, and friends still in the farming sector, and they really cared about farm family welfare. The Land-Grant system itself was exeptionally well linked to its client system. The farmer of those days was an experimental person and seldom accepted a technological innovation without either trying it out in his own farming system or observing it in a similar system. The result demonstration is widely acclaimed as perhaps the most effective extension device yet developed. The real role of the extension demonstration, however, appears to be that it facilitated farmers' experimental processes more than "showing" them something.

Experiment station workers did some on farm tests, but they did not make them much of an issue. The branch experiment station was widely used for geographic area testing and adaptation, and extension workers were as closely connected to it as were experiment station workers. Extension did report problems they encountered with their demonstrations, and this feedback effectively made the "demonstration" into a "field trial."

Finally, the Land-Grant system seldom worried about the research-extension boundry, and researchers working in the area-speciific research area did a considerable amount of extension work. Likewise, extension had an experimental attitude, and some extension workers did considerable experimental work.

Research and extension were not separated until 1910, when the USDA prohibited the use of Hatch Act funds for extension purposes. A federal appropriation for extension was achieved in 1914. The evidence is that this research-extension split resulted more from a bureaucratic strategy to increase funding than it did from an inherent philosophical distinction between research and extension in the technology innovation process. Today, in the United States the terms "research" and "extension" refer more to administrative forms than to process concepts. The research-extension wound in the U. S. system was rapidly healed by the emergence of the professional category known as the extension specialist.

Even with all these "natural forces" going for it, the Land-Grant system took some definite steps in the direction of FSR/E. A Cornell University agronomist, recognizing that special "one issue advice" to the farmer was not adequate, tried to tie the specialists together into a systems approach and initiated the field of farm management, one of the ancestors of the modern discipline of agricultural economics. That effort resulted in farm management surveys and delimitation of "type of farming areas," reminiscent of the formal survey and recommendation domain of modern day FSR/E. (Incidently, the field of rural sociology sprang from agricultural economics and thus traces its ancestry back to agronomy also.)

In its technical assistance efforts, the U.S. Land-Grant system went into the developing countries with something of a distinction between research and extension. Point IV was largely an extension effort. This research-extension distinction was confounded by another error, the U.S. failure to recognize the critical role of the extension specialist.

These impact of these errors was exacerbated by another development that was taking hold in the Land-Grant system about the time the technical assistance activities of the universities was building up. That was the drift toward science. The system dealt largely with technology until World War II. Since then the Land-Grant research establishment has placed an increasingly heavy emphasis on science and has steadily withdrawn from technology development. In the meantime, extension has not compensated for this reduced attention to technology, although there is no conceptual reason why it has not.

Developing country programs made a significant distinction between research and extension and soon began to use the terms as process concepts. As process concepts they have no power. This tendency was exacerbated by a growing professionalism, especially in extension. In a developing country setting, the most reliable way to distinguish between research and extension is to keep a safe distance between the activities of the two organizations. It was clear that the field agent was extension and that the experiment station worker was research. It was also clear that activity between the experiment station and the local agent would mess up the jurisdictional situation. Few of any developing countries have developed the extension specialist concept to the extent that was critical in tieing the parts of the system together in the United States. The criticism that the United States took the Land-Grant system overseas and found it did not work in the developing countries rests on a faulty foundation. Some critical components of the Land-Grant system were not taken overseas.

The Land-Grant system never taught its students about itself, probably because it did not understand some fundamental and profound processes that were actually working. As a result Land-Grant college graduates did not completely share the Land-Grant tradition. It was the Land-Grant graduate (for example, Donald Winklemann, Peter Hildebrand, Hubert Zandstra, Robert Hart, Elon Gilbert, and many others) without professional experience in the system that was largely responsible for the reinvention. They cannot be criticized for it. Personnel who had professional experience in the Land-Grant system, for some reason were unable to diagnose the problem and find in their own tradition a basis for a solution. Professional workers of the system know it intuitively, not objectively, and as a result they could not help others adapt it to their own needs. The reinvented FSR/E is recognizable as a distinct thing, and because it is it will probably not get lost as institutional concerns drift with the times. It can be useful to the Land-Grant system, now almost schizophrenic in the face of the science-technology dichotomy, and perhaps more in need for a sense of direction than it itself recognizes.

APPENDIX 3

A CLARIFICATION OF TERMINOLOGY

Several recent publications have attempted to refine the various definitions of FSR. TAC had been calling for such systematic clarification since 1978 (Dillon et al., 1978), but in the rush to describe field activities, FSR practitioners spent little effort hammering out a definitive methodological statement (Bremmer, 1983). In fact, such a stand early on would have contradicted the open experiential process of FSR methodological development. However, confusion over definitions and the numerous types of activities to which the term is applied was preventing systematic review and evaluation of its positive results, and donors were beginning to have second thoughts about the cost of the approach and their continued support.

Major efforts to clarify and reconcile the various definitions have been made by Rheades and Booth (1982), Shaner et al., (1982), Waugh and Hildebrand (1983), Fresco (1984), Simmonds (1985), Sands (1985), Stoop (1985), Plucknett et al., (1986), Norman and Collinson (1985), and Bawden et al., (1985). Each of their proposed definitional frameworks is summarized briefly in Appendix 4. Unfortunately, few of the proposed frameworks are equivalent, several introduce latin terms (as if to clarify), and others propose large new sets of acronyms. Some observers believe that these efforts have muddied the waters even further. This problem has been compounded by attempts to rewrite the lexicon and suggesting whole new sets of acronyms. If complete standardization cannot be achieved, then at minimum, efforts should be made to establish where equivalent terms or concepts exist (Plucknett et al., 1986).

This presents a dilemma. While consistency is needed to foster continued external acceptance of FSR (and continued donor support), there is a danger in cutting off internal creativity as evidenced by the terminological diversity which drives FSR as a young, dynamic and flexible approach to problem-solving. In addition, though Plucknett et al., (1986) called for simplification and standard terms, none of the acronyms they proposed have appeared with any great frequency in the growing literature now available on FSR.

Aside from the acronym soup, there are three important problems with most of the proposed definition sets presented in Appendix 4. First, only a few of the revisions propose an over-arching generic term for the various applications of the approach (Sands, 1985; Stoop 1985). It is also unclear whether there are linkages between these applications in terms of setting priorities, providing additional information, or conducting analysis. Second, several revisions indicate a distinct separation between research conducted on-farm and that conducted on-station (Sands, 1985; Plucknett et al., 1986). As emphasized earlier, OFR does not replace commodity or station-based research. The objective is complementarity. OFR can play a major role in setting priorities for station-based research and determining parameters for evaluating potential technologies. The linkages between the two must be explicit. Third, none of the sets of definitions deal clearly with the linkages between research and extension. This problem raises two important questions. If there is no mechanism to disseminate the results of FSR, then how can the approach be evaluated in terms of farmer adoption? Will the natural diffusion of a "good technology" be enough to satisfy the demands of rigorous evaluation, not to mention the demands of agricultural development as a whole? "Incorporating the [FSR] research results into the extension program has received lip service, but little real consideration" (Bremmer, 1983).

There are several reasons why extension has not been well-integrated into FSR. First, with no field-level results forthcoming from FSR, it was easy to adopt the attitude of worrying about integration when it became a constraint (Bremmer, 1983). Second, a major push behind FSR during the past decade has come from the IARCs, which explicitly do not work directly with extension. The focus of all IARCs is research, and their primary clients are the national agricultural research services (NARS). Some IARCs view their role as "one of providing research procedures and training, not in developing technologies themselves ...clients in this work are the national agricultural research services (NARS)" (CIMMYT, 1986). If the IARCs view their role as one of training practitioners to use the FSR approach, and yet ignore the national location of the approach within research and extension systems, then training is incomplete. Additionally, if FSR calls for a reorientation in how researchers program their research activities, then it should also call for reorientation of extension's role. Bremmer (1983) states that regardless of the FSR style, "it clearly requires that the the extension agent play a more active role....in other words, it requires them to think...[and]...reverses the current direction of extension programs in developing countries."

The addition of extension to FSR is strengthened by a review of national agricultural research systems of 17 countries in Africa, Asia and Latin America conducted by ISNAR (Stoop, 1985). One of the conclusions common to nearly all reviewed countries was that more direct and stronger linkages were required between research, farmers and extension services. Involving extension workers in the OFR process eliminates the need to teach them new technologies, encourages them to critically review new technology while it is being developed, and because they follow the on-farm trials under local conditions, "their confidence in making recommendations to growers is greatly enhanced" (Swisher, 1986). (See Appendix 5).

Based on the issues and concerns raised above, and synthesizing many of the positive aspects of the various classification schemes proposed, a revised framework is proposed in Figure 1. Both definitional and functional relationships are presented in the diagram. In agreement with Sands (1985) and Stoop (1985), the term "Farming Systems Perspective" (FSP) is used as the generic cover for all applications. This term is particularly useful because it does not distinguish between research and extension or crops and livestock, and accurately underlines the fact that the approach is a perspective for conducting research and extension, not a substitution for either. All of the various activities conducted with a Farming Systems Perspective are assembled under three categories: Farming Systems Research and Extension (FSR/E), Research on Farming Systems (RFS), and New Farming Systems Development and Farming Systems Research and Development (NFSD/FSRAD). Each of these can be considered as approaches using a farming systems perspective.

FSR/E improves upon the original term, FSR, by clearly stating the need for explicit linkages among and involvement of farming, farmers, researchers and extension workers in the approach. FSR/E includes all of the previously-mentioned definitions for FSR conducted in a step-wise, iterative, farmer-oriented, farmer-involved fashion, based on the existing system and designed to generate technology appropriate and adaptable to a specific farmer group. It is also the category singled out by the authors to have the greatest immediate potential for improving the agricultural livelihood of low-resource farmers, particularly in Africa, whether applied at the level of IARCs, NARES,

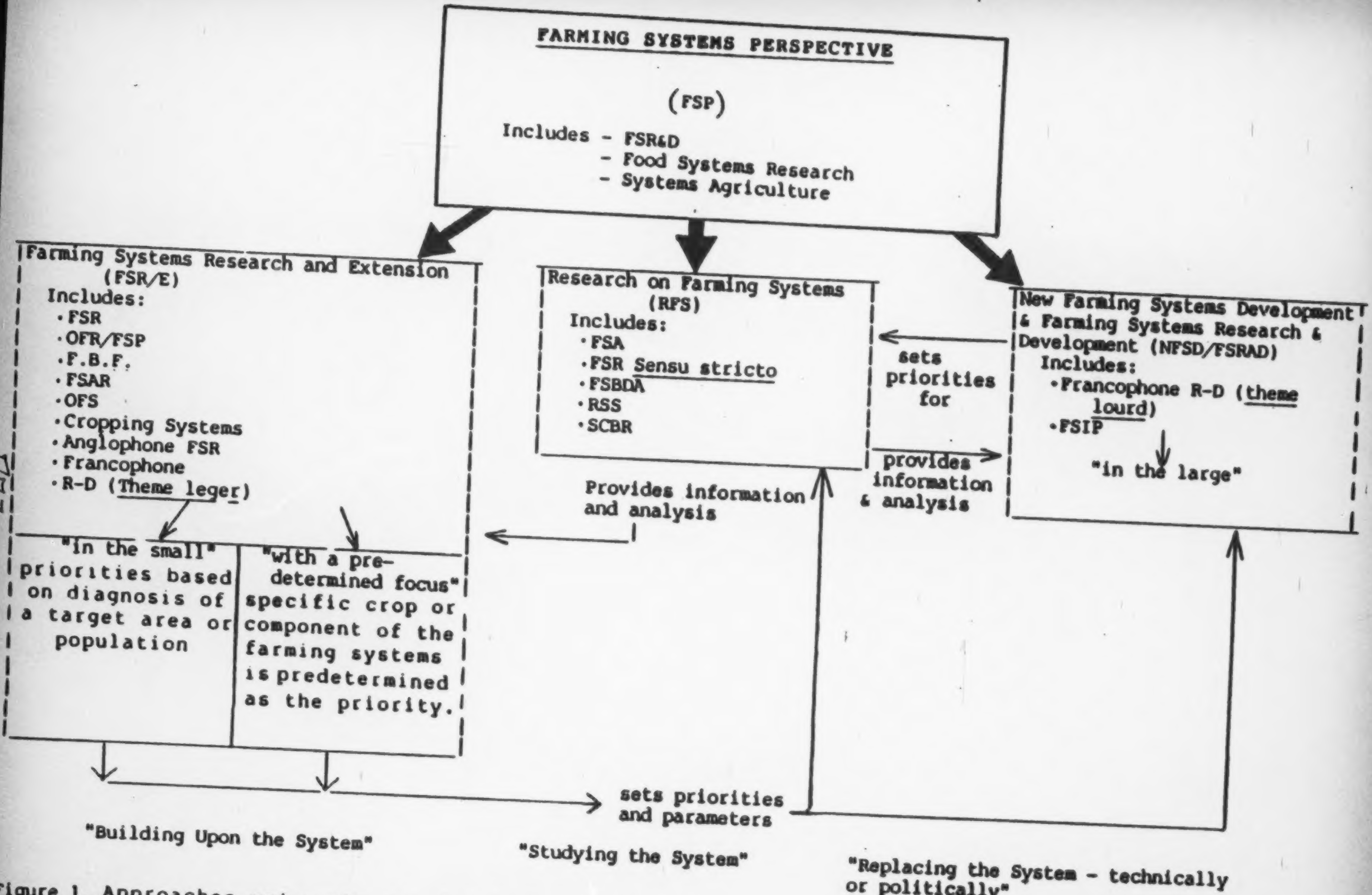

FARMING SYSTEMS PERSPECTIVE
(FSP)
Includes - FSR&D
- Food Systems Research
- Systems Agriculture
Farming Systems Research and Extension
(FSR/E)
Includes:
·FSR
·OFR/FSP
·F.B.F.
·FSAR
·OFS
·Cropping Systems
·Anglophone FSR
·Francophone
·R-D (Theme leger)
"In the small" priorities based on diagnosis of a target area or population
"with a pre-determined focus" specific crop or component of the farming systems is predetermined as the priority.
Research on Farming Systems
(RFS)
Includes:
·FSA
·FSR Sensu stricto
·FSBDA
·RSS
·SCBR
Provides information and analysis
sets priorities for
provides information & analysis
New Farming Systems Development & Farming Systems Research & Development (NFSD/FSRAD)
Includes:
·Francophone R-D (theme lourd)
·FSIP
"in the large"
sets priorities and parameters
"Building Upon the System"
"Studying the System"
"Replacing the System - technically or politically"

Figure 1. Approaches using the Farming Systems Perspective. Acronyms are defined in Appendix 4.

or both. FSR/E can operate "in the small" by deriving the focus of activity from within the system in the course of diagnosis, or "with a predetermined focus" by moving into the system to research and improve a specific aspect that was determined before the work was initiated (Norman and Collinson, 1985). Each of the two operating mechanisms have different implications for gaining leverage in the system and for institutionalization, as will be discussed later. Whether operated "in the small" or "with a pre-determined focus," FSR/E can be characterized by the phrase "building upon the system."

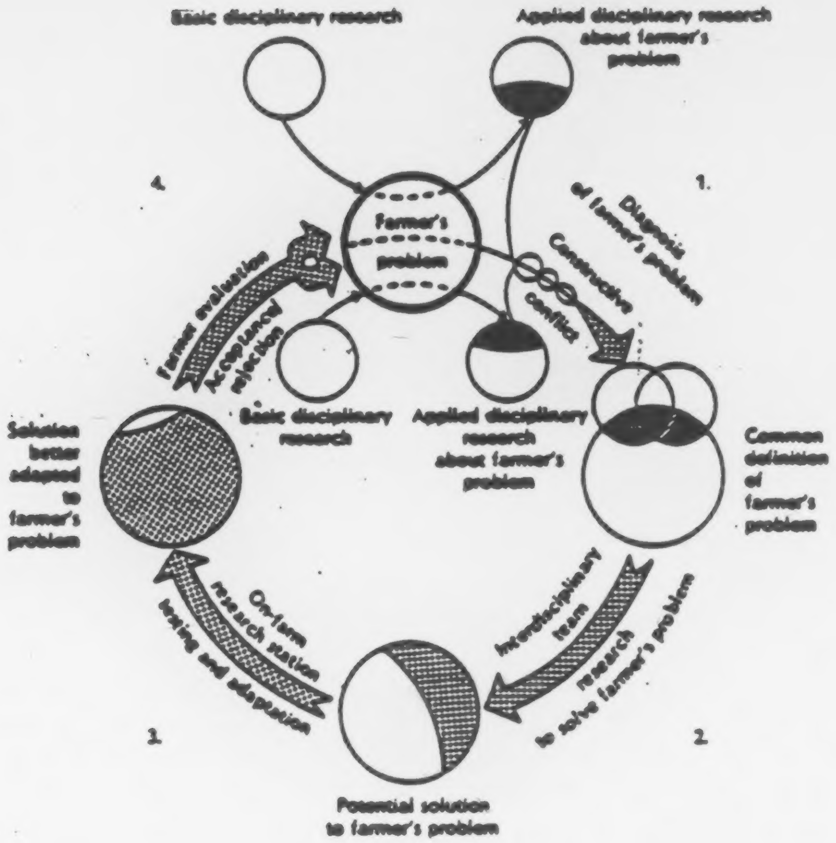
Research on Farming Systems (RFS) includes the large body of existing descriptive and analytical research on farming systems conducted by anthropologists, geographers, and agronomists around the world (such as Ruthenberg, 1980). It also includes current research being done on problem areas which have been identified through on-farm research. A good example of this is the research on the consumption linkages within FSR/E (Frankenberger, 1984) and recent work to clarify and analyze inter- and intra-household dynamics and gender issues in FSR/E (Poats and Schmink, forthcoming). Simmonds (1985) gives RFS short shrift, stating that it is "essentially an academic activity good for generating Ph.D.'s, but not much use to agricultural research." Simmonds is partially correct in that RFS could be (and often is) construed as research for research's sake. However, it is precisely the persistant efforts of the researchers on farming systems who have provided practitioners with much basic knowledge of the intricacies, complexity, and science of traditional farming practices. Sondeos, rapid rural appraisals and diagnostic surveys are feasible primarily because they are built upon the knowledge gained from RFS. Were it not for the persistant application (applied often necessarily with a large hammer) of the results from research on gender in farming systems, this concept would still be one of the serious omissions from FSR/E. Within the FSP, RFS provides basic information and analysis. RFS can be characterized by the phrase "studying the system". With better linkages to applied activities, RFS can be more focused on priority problems.

NFSD and FSRAD are linked as activities which necessitate a large, macro-level analysis, seek innovations and interventions which will impact on farming systems as a whole, or explicitly consider policy implications. This includes the "theme lourd" approach from the French Recherche-Developpement (see Appendix 7 for further discussion of francophone approaches.) Norman and

Collinson (1985) have referred to these as "in the large" because in it they treat "all system parameters as potentially variable in a wide-ranging search for improvement." Many practitioners discredit this approach saying that it is "top-down," or impractical because the focus is not step-wise generation of technology. However, for low-resource farmers in Africa, relocated to new agricultural areas, and facing severe policy constraints prohibiting the most effective and efficient use of their resources, or for others confronting ecological changes beyond their capabilities for adaptation within any reasonable length of time, NFSD may represent the most appropriate application of the FSP approach. In the real world, not all changes should or can be step-wise; many farmers' circumstances cry out for radical alterations, however difficult they may be to achieve in practice; and there must surely sometimes be room in agricultural research for something wider and more imaginative than the step-wise process, even if the last, is, in real life, the norm." (Simmonds, 1985). In other respects, until changes are made in the policy environment to overcome inequities, the most appropriately generated technology may be of little use. NFSD and FSRAD can be characterized by "replacing the system---technically or politically."

Some brief comments about OFR/FSP (Collinson, 1982) and Farmer-back-to-farmer or FBF (Rhoades, 1982) provide insight into two important aspects of FSR/E. The process of OFR/FSP, shown in Figure 2, exhibits the circularity and linkages now considered as hallmarks of FSR. OFR/FSP also shows the necessary and dynamic linkages between on-farm and on-station research. Station-based research programs need to draw more and more priorities from the unsolved problems identified by the on-farm part of the research process. Researchers should be involved in both aspects simultaneously. Hildebrand and Poey (1985) have demonstrated, using modified stability analysis of on-farm trials, that it is important to consider station results as one of the many environments under which a technology is tested. Disciplinary and commodity or component research are also explicitly linked to on-farm adaptive research in the diagrammatic representation of OFR/FSP.

The FBF model for generating acceptable technology (Rhoades and Booth, 1982) in Figure 3 also shows circularity, interdisciplinarity, basic and applied research, and on-station/on-farm linkages. More importantly, the model makes explicit the need to begin and end with the farmer, and involve


Basic disciplinary research
Applied disciplinary research about farmer's problem
4.
1.
Farmer's problem
Diagnosis of farmer's problem
Constructive conflict
Farmer evaluation
Acceptance rejection
Basic disciplinary research
Applied disciplinary research about farmer's problem
Solution better adapted to farmer's problem
Common definition of farmer's problem
Interdisciplinary team research to solve farmer's problem
On-farm research station testing and adaptation
3.
2.
Potential solution to farmer's problem

Activities	Goals
1. Diagnosis of farmer's problem	Common definition of problem by farmers and scientists
2. Interdisciplinary team research to solve farmer's problem	Identify and develop a potential solution to the problem
3. On-farm testing and adaptation	Better adapt the proposed solution to farmer's conditions
4. Farmer evaluation	Understanding farmer acceptance or rejection of solution

Farmer-back-to-farmer — a model for generating acceptable technology (adapted from Rhoades and Booth 1982b).

Figure 3: Farmer-back-to-farmer (FBF) model for generating acceptable technology (From Rhoades and Potts, 1985)

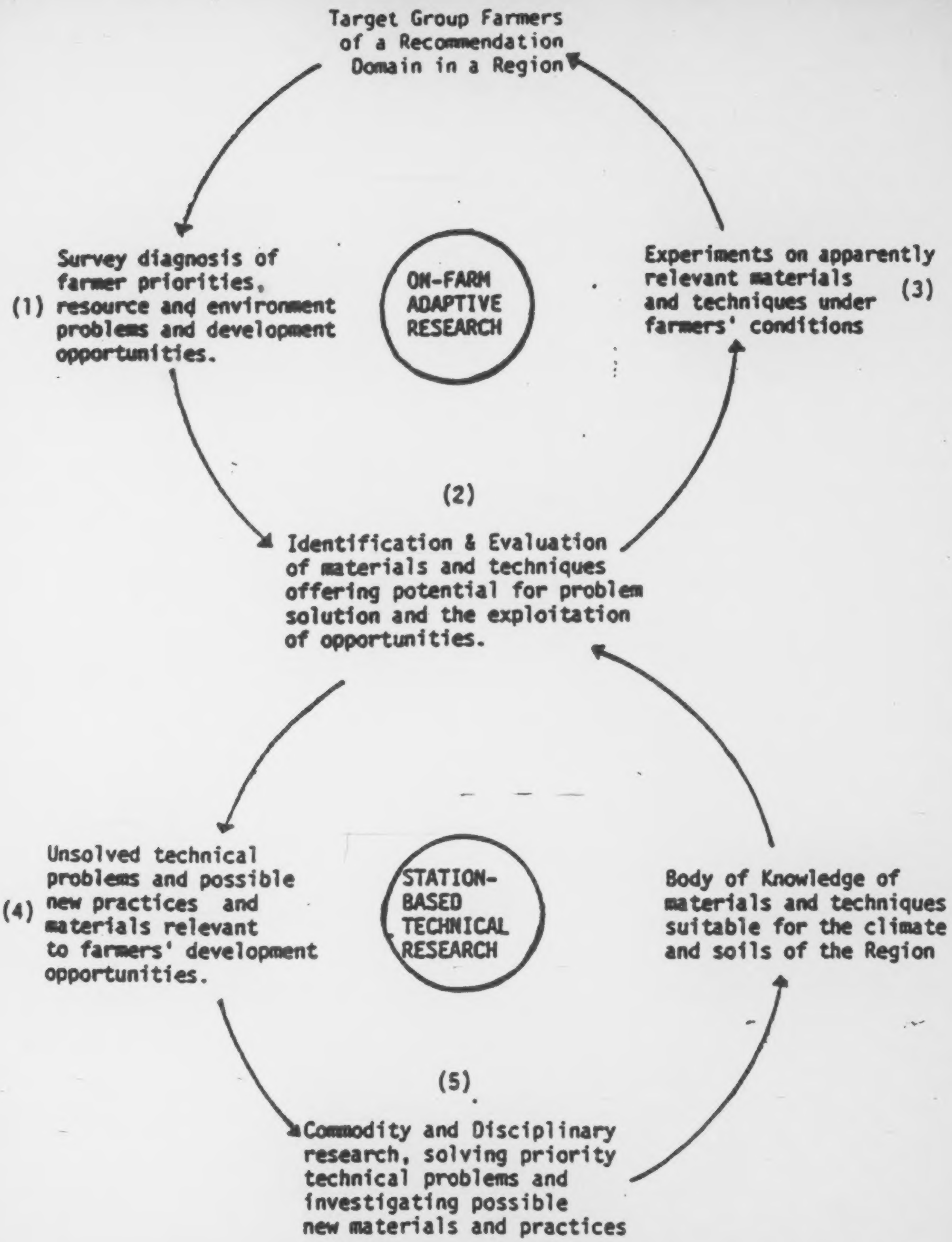

Target Group Farmers of a Recommendation Domain in a Region
(1) Survey diagnosis of farmer priorities, resource and environment problems and development opportunities.
ON-FARM ADAPTIVE RESEARCH
Experiments on apparently relevant materials and techniques under farmers' conditions (3)
(2)
Identification & Evaluation of materials and techniques offering potential for problem solution and the exploitation of opportunities.
(4) Unsolved technical problems and possible new practices and materials relevant to farmers' development opportunities.
STATION-BASED TECHNICAL RESEARCH
Body of Knowledge of materials and techniques suitable for the climate and soils of the Region (6)
(5)
Commodity and Disciplinary research, solving priority technical problems and investigating possible new materials and practices

Figure 2. Interactions between Station-based Technical Research and On-Farm Adaptive research. (From Collinson, 1982)

farmers in the identification of problems. Explicit also in this model is the farmer's adoption or rejection of the solution as the criteria for evaluating technology. Evaluation in FSR/E often stops short of farmer adoption, using instead criteria of technological performance under tests of location specificity and farmer management. However, to truly determine the adaptability of a technology, the approach must be carried forward to determine if and why (or why not) technical solution were (or were not) adopted. The process necessarily starts all over again in the event of non-adoption and builds upon the previous experience, even if it is negative, toward another resolution of the problem. Learning from what does and doesn't work from the farmer perspective is a crucial dimension of FBF and FSR/E in general.

APPENDIX 4

DEFINITIONS

1. Fresco (1984) defined three general FSR categories or approaches.

* Cropping Systems Research (CSR): which seeks technologies that will increase production by introducing additional crops, new varieties or improved management into existing systems.

* Anglophone FSR: which is primarily concerned with the adaptation of existing agricultural research to provide technology relevant to low resource, low external input farmers. The emphasis is on the whole farm as a system and focuses on (i) interdependencies between the components under the control of members of the farm household and (ii) how these components interact with physical, biological and socioeconomic factors not under the household's control.

* Francophone FSR: which constitutes an integral part of a long-term, country-wide rural development effort. The emphasis here lies on developing the potential of a (sub-) region in which technology provides a starting point. On the basis of an assessment of this potential, i.e., the maximum production that can be achieved given the ecological conditions and optimal input and management levels, this approach defines the steps that will lead farmers to a complete transformation of their farming systems.

2. Bowden et al, (1985) in reviewing Fresco, proposed that a fundamental distinction existed between the three categories in terms of perspective and methodology, and that it reflected a

> "fundamental systems concept of emergent properties in hierarchic relationships. In other words, each of the three types addresses different levels within a systems hierarchy, extending from the cropping subsystem through the whole farm to the larger regional aggregation of farms in conjunction with institutional infrastructures" (Bowden et al., 1985).

3. Simmonds (1985), for the World Bank, followed with a three part classification system, based primarily on work conducted by the IARCs. Since the

influence of IARC thinking is an strong factor in the development and change of national agricultural research in developing countries, and therefore among low-resource farmers, the attempts to reconcile the various IARC devinitions of the approach must be considered:

* FSR sensu stricto: "is research on farming systems as they exist, their description, analysis, classification and understanding. It can go to any depth but typically goes deeply into the agriculture, economics and social context of the system studied. It is essentially an academic activity good for generating PH.D.'s but not much use to agricultural research."
* On-farm research with a farming systems perspective (OFR/FSP): "starts from the FSP bit which is just enough FSR sensu stricto for the job in hand (but no more). It uses the FSP to help define the on-farm research (OFR) necessary for practical progress. It is a 'style' of doing agricultural research founded on the well-justified assumptions that changes need to be adapted to the circumstances of their users and that on-station experiments by no means always predict farm experience. The OFR/FSP 'style' broadly assumes that progress will be step-wise rather than revolutionary and devotes itself to a cautious, empirical evolutionary process."
* New farming systems development (NFSD): "contrasts with the preceding in seeking to generate revolution rather than evolution, to build radically new systems ab initio. It is essentially practically orientated agricultural research and must (obviously) be founded on at least some FSP (but maybe not much). It differs from OFR/FSP in degree rather than in anture (both seek to generate beneficial change) but is necessarily has a lesser OFR component (indeed it may have almost none)."

4. Sands (1985), on behalf of the CGIAR, followed Simmonds with a more detailed classification system. Based also on the IARCs, the paper was commissioned to serve as a guide for discussion of the future of FSR within the IARCs at an IARC conference held at ICRISAT in early 1986. Sands proposes to abandon the term "Farming Systems Resarch" because "it is imbued with too many preconceptions." Research with a Farming Systems Perspective (FSP) is proposed as the generic term for the approach. She then defines six types of research activities under the FSP heading:

* Farming Systems Analysis (FSA): "the in-depth, quantitative, analysis

of an existing farming system generally resulting in a system model." (Corresponds to Simmonds FSR sensu stricto.)

* Farming Systems Adaptive Research (FSAR): "the interdisciplinary, on-farm, adaptive research activity targeting a defined, relatively homogeneous group of farming systems." (Corresponds to OFR/FSP, and includes both Fresco's anglophone category and the cropping systems subsystem.)

* Systems Component Basic Resarch (SCBR): "the technical, station-based research focusing on farm sub-systems or components designed to support FSAR." (In FSR/E and OFR/FSP, on-farm research and on-station research are seen as joint pieces of the same process.)

* Farming Systems Base Data Analysis (FSBDA): "the analysis of base data from a designated agro-climatic zone with the two-fold objective of increasing knowledge of the physical environment of the zone and developing a classification of major types of farming systems."

* New Farming Systems Development (NFSD): "the research programs designed to create new farming systems rather than modify existing systems through an evolutionary process." (taken from Simmond's definition).

* Farming Systems Research and Agricultural Development (FSRAD): "the farming systems programs which integrate technological and institutional change for the agricultural development of a targeted sub-region." (Corresponds to Fresco's (1984) definition of Francophone FSR or Recherche-Developpement).

Sands goes into some detail in the definitions for each type and provides examples from within the IARC community. However, she argues that all six are derived from the "post-Green Revolution conceptual shift in agricultural research and development", and that all share the recognition that small-farm agriculture in developing countries" requires a different institutional structure and experimental framework for relevant agricultural research and technology development." They also share concepts of interdisciplinarity, systems analysis, and the building upon, and complementarity with, commodity and disciplinary research. Except for NFSD, all base technology generation upon knowledge of the existing farming system.

5. Stoop (1986) states that ISNAR will continue to classify FSR approaches in the manner proposed by Simmonds. He further indicates that ISNAR focuses on FSP sensu stricto and OFR/FSP, and recommends that efforts in NFSD be minimal

on the part of NARS, concentrating resources instead on strengthening disciplinary and commodity-oriented programs which would be mutually complementary to FSP sensu stricto and OFR/FSP.

6. Plucknett et al. (1986) argue that the three interlocked multidisciplinary "activity areas" as defined in the Stripe Review — Base Data Analysis, Research Station Studies, and On-Farm Studies — should be maintained as the classification system. These may be sequential, cyclical or concurrent. They also strongly disagree with the replacement of "FSR" with "FSP", stating that FSR, for all its problems, has become a well-recognized "handle" to identify the important conceptual and methodological breakthroughs embodied in the approach.

7. Rhoades and Potts (1985) define the Farmer-back-to-farmer (FBF) as the model used by CIP to generate acceptable technology for farmers (See Appendix 3 for a brief description).

8. Hildebrand and Waugh (1983) defined two complementary components within the larger framework of Farming Systems Research and Development (FSR&D):

* The Farming Systems Approach to Infrastructural Support and Policy (FSIP): deals with policy, and the variables it treats are mainly outside the farm gate and involve more social scientists and economists than agrobiological scientists. The principal product is information and the clients are policy makers and managers of sedrvices and infrastructure.

* The Farming Systems Research and Extension (FSR/E): is more micro in scope and deals mostly with conditions inside the farm gate. It is applied, farmer oriented research supported by socio-economic sciences in a team effort which includes extension responsibilities, The principal product is technology and the primary clients are farmers.

APPENDIX 5

EXTENSION IN FARMING SYSTEMS RESEARCH

In the traditional research and extension paradigm, extension agents are viewed as passive recipients of research results, which are forwarded to them in the form of recommendations. Educating agents about new technologies is viewed as a separate step in the process of information dissemination. One result of this paradigm is that considerable energy and money is spent on agent education — sometimes on topics that the agents do not see as useful or interesting. Another result is that agents often regard recommendations with skepticism because they do not know how the recommendations were derived or whether they will prove valid under local conditions.

The FSR/E alleviates these problems. The agent is intimately involved with researchers and the research process. One result is that their awareness of new technologies is ensured. Agent education becomes part of a continual, ongoing process. Further, because agents help develop research questions and because they can see the results of research trials under local conditions, their confidence in making recommendations to growers is greatly enhanced. Too often, extension agents function almost entirely in a reactive mode, responding to both opportunities and problems as they arise on an ad hoc basis. This hinders the agent's ability to prioritize his or her own activities. The end result is often that agents are unable to achieve significant impact in any given sector, even though they may be very helpful to many farmers and their time may be fully occupied.

For successful program implementation and to achieve measurable impact, a proactive stance is required. This requires setting both long-term and short-term goals, prioritizing activities in order to achieve those goals, and developing measureable objectives by which success can be evaluated. The FSR/E approach aids in this process because it enables the agent to function as part of a larger team which supports the agent's efforts. Acting as a member of a larger team with well defined priorities and objectives, the agent's ability to prioritize his or her own educational efforts is enhanced and the tendency for the agents to be left as a single individual, reacting to their environment on an "on-demand" basis is reduced. (Swisher, 1985)

APPENDIX 6

COMMUNICATION BETWEEN RESEARCH AND EXTENSION IN THE GAMBIA

One example of improved communication between research and extension appeared at a recent FSR/E workshop in The Gambia, where the beginnings of an open communication between research and extension personnel were witnessed. This FSR/E workshop provided the forum for the extension personnel responsible for implementing field trials to meet for the first time with their research counterparts in a session in which substantive ideas could be exchanged. Previously, designs of trials were passed from research to extension with absolutely no discussion of objectives, justification, methods, rationale, goals, or experimental design. Extension personnel vividly described their feeling before the workshop as one of standing under a "concrete hard pan" between themselves and research: there was literally no communication (Gambia FSR/E Workshop, June, 1985). Extension was able to use the forum of the workshop to break through this barrier and establish communication. The following year, when representatives of both groups were brought together once more in a follow-up workshop, communication between the two groups was an on-going process (Gambia FSR/E Workshop, April, 1986).

APPENDIX 7

THE FRENCH RECHERCHE-DEVELOPPEMENT APPROACH

The development of the Research-Development (R-D) approach has been detailed elsewhere (Benoit Cattin and Faye, 1983, Fresco, 1984, Fresco and Poats, 1986) and is only summarized here. The approach initially began with disenchantment with the lack of results from French development projects implemented largely in Senegal, which was the base for much of the French supported agricultural research for the former French colonies of West and Central Africa. This early work focused on cash crops and large-scale technical innovations (introduction of animal traction, animal and variety breeding programs and cultivation techniques). Though considered failures, important insights for the recherche-developpement approach were gained from the experiences (Tourte 1971): farmers maximize production within systems geared to the socioeconomic and ecological environment; research priorities must be defined with understanding of rural environment and national priorities; the transfer of research results through the extension service is inadequate, and results developed in the artificial context of research stations are inappropriate; technologies must fit within integrated systems; and integrated systems must be field tested in order to identify constraints in their application.

The experiences of the Unites Experimentales (village-level experimental units) in Senegal (Benoit-Cattin and Faye, 1982) provided new perspectives on farmer involvement in experimentation, refined data collection methods, established explicit linkages between research and development organization, and used production systems as the unit of analysis. They also led to the development of two development "themes" which characterize French initiatives today. These are (1) light innovation (themes legers), and (2) fundamental innovations (themes lourds). Light innovations are step-wise incremental changes in a farming system through the introduction of technologies that do not alter the fundamental structure of the basic system (i.e., new varieties). Fundamental innovations form a coherent package aimed at an overall intensification and profound transformation of traditional production systems (i.e., land reorganization).

There is also a trend today for French-speaking African practitioners to use terms (i.e., "Recherche sur les Systemes de Production") which correspond more directly to the English "FSR". None of these newer alternative terms explicitly mention extension except as a part of overall development. However, the current tendency is to be less concerned over the precise terms used, and to concentrate instead on similarities in concepts, applications, problems, and results. This was especially evident at the recent West African Farming Systems Research Network (WAFSRN) meeting in Dakar, Senegal, March, 1986.

Current French bilateral initiatives in this area continue to employ the recherche-developpement term, defined by Billaz and Dufumier (1980) as the study of the application, on the basis of tests conducted under real physical and socioeconomic conditions, of technical and social changes, in particular the intensification of production and the creation of producer organization and delivery or extension systems. Fresco (1984) and Fresco and Poats (1986) have pointed out major contributions to FSR/E from the French, and compared Francophone and Anglophone efforts. Bellon et al. (1985) have reviewed, at a conceptual level, 4 FSR and 4 R-D projects. However, the former group is composed of all IARC's (IRRI, CIMMYT-Nairobi, ICARDA and ICRISAT-Burkina Faso) while the latter is all national programs supported by bilateral assistance programs (IDESSA-Ivory Coast, Nepal, DRSPR in Southern Mali and Madian-Salagnac in Haiti). The two groups serve two different primary clientele: the clientele of the former is largely national researchers, while the clientele of the latter is farmers. As a result, differences between the approaches advocated within each group are probably due more to their different respective mandates than to the particular name of the approach.

Though there is growing convergence between the two approaches there are two key differences between the two groups (Bellon et al., 1985). The first relates to the time spent on diagnosis. R-D generally calls for a lengthy, detailed diagnostic phase, often coupled with extensive mapping, surveys, observations and historical research. FSR/E is viewed as having only a very rapid diagnosis, after which decisions are made and experiments designed. Closer study reveals that those in FSR/E spend less time on diagnosis as a single activity, but move into on-farm experimentation as a way of continuing diagnosis through monitoring, involving farmers in trials, and involving researchers and extension agents in farmers' fields. It should be highlighted that there is little or no explicit attention given to gender issues in R-D, neither as a diagnostic nor an analytical tool, while FSR/E is beginning to make headway in this area.

The second key difference is whether the objective is to promote technology or to promote farmers (peasants). Bellon et al. (1985) argue that FSR/E is oriented to the former while the R-D is guided by the latter. Again, the apparent difference may not be inherent in the approach, but in the institution operating it, particularly if the institution has a mandate to produce technology. In R-D, heavier emphasis is placed on the diagnostic phase than on testing (experimental) activities.

Other experiences in Mali, Tunisia, Burkina Faso, Algeria, Ivory Coast, Niger and Cameroon, plus project work outside Africa in Nicaragua and Nepal, have contributed to the current philosophy, methods and concepts embodied in the R-D approach. R-D is usually viewed as taking a broader perspective involving both micro and macro issues, rather than being limited to innovations only at farm level. Concommittantly with identifying production constraints at farm level, the approach embodies the development of policies and methods to improve the socioeconomic conditions of production. The approach links research and development, but often proposes bypassing traditional extension systems in favor of the development of farmer groups or collectives for the purpose of information and technology exchange. Traditional extension is often viewed as being too hierarchical (GRET, no date).

APPENDIX 8

FSR/E AND IDRC, CANADA

"IDRC has been very strongly committed to FSR for the past 15 years ....it will stay committed for the next 50."

Andrew Ker, IDRC, March 11, 1986

It is important to note the role that the International Development Research Centre (IDRC), Canada, has played in promoting the implementation of FSR/E approaches in national programs. Though they use the term "cropping systems" to identify most of the activities they support, the concepts and philosophy embraced are in keeping with the definition given for FSR/E. IDRC's position on the role of FSR/E in Africa is strongly tied to their "bottom-up" philosophy. Rather than attributing Africa's poor adoption of existing agricultural recommendations solely to infrastructural or extension-related deficiencies, IDRC points to the need for technology to first fit the farmers' needs and situation.

At IDRC, cropping systems research resides within the Agriculture, Food and Nutrition Sciences Division (AFNS), which encourages a systems approach in all projects in order to ensure that research results benefit intended beneficiaries (IDRC, 1981). The AFNS systematic approach is intended to "short circuit" conventional top-down research and requires research to be undertaken cooperatively with recipients (IDRC, 1981).

The approach advocated by IDRC is based on the division's early experience in Colombia during the Caqueza Project, the first farming systems research project supported by AFNS (Zandstra et al, 1979). These experiences were then carried to Asia and benefited the development of the Asian Cropping Systems Network (now the Asian Farming Systems Network). Coming full circle, the methodologies and experiences refined in Asia are now guiding the definition and implementation of a steadily increasing number of cropping and farming systems projects in Africa, Asia and Latin America. More recently, this experience is being shared with national researchers in West Africa.

At a conference in Nairobi, sponsored by IDRC in 1983 (Kirkby, 1984), the development of programs for cropping systems research or farming systems research was identified as one of five major trends in food-crop research during the past decade in the region. The major result of this trend is the convergence in views and actions between technical scientists and agricultural economists. Conference participants agreed that the introduction of FSR/E in the region "represents an attempt to institutionalize a set of procedures for developing useful new technology that should be more rational and realistic than if each commodity research program were to continue pursuing, in isolation, a strategy for increasing the production of a particular commodity" (Kirkby, 1984).

At the conference, participants resolved that better definition of the roles between commodity teams and FSR/E could come about through the establishment of cropping improvement coordinating committees (CICC) which would coordinate, monitor, and evaluate agricultural research. Specifically, the CICCs would assist in creating and coordinating commodity team cooperation with farming systems research teams. This model, or variations of it, is being implemented in several African countries, including Zambia and Malawi.

In keeping with their philosophy, and in contrast to the IARCs and most other bilateral donor projects, IDRC has placed its emphasis on funding national researchers to conduct projects. The funding level is considerably lower than most donor projects in agriculture, primarily because there is little or no reliance on expatriate teams. IDRC supported activities are sometimes linked with IARC FSR initiatives, but most of the planning and implementation of the projects is done with national researchers and a regional project officer. Occasionally, IDRC has funded an expatriate adviser; yet national leadership is being developed and the projects retain a strong national identity, rather than a donor identity. Among over 250 projects identified in the FSSP inventory of FSR/E projects worldwide, close to 50% reported some form of support from IDRC (FSSP 1984). The crops and cropping systems group of AFNS has administered more than 44% of the 400 projects approved and slightly more than 50% of the total AFNS budget appropriated during the past decade. The average project cost has been close to $250,000 (Canadian dollars), with an average project duration of 35 months. In the past decade, projects were supported in 46 countries, 27% in Africa, 25% in Asia, 21% in Latin America, 14% in the Near East and 13% in Canada. Examples of

IDRC-supported projects in Africa with a FSR/E perspective include the highland maize project in Burundi, the Tanzanian projects based out of Morogoro University, the efforts in southern Mali in support of the Institut d'Economie Rurale, on-farm research in Uganda, and the Njala University's farming systems efforts in Sierra Leone.

APPENDIX 9

POTENTIALS AND LIMITATIONS OF FSR/E FOR PROMOTING OTA'S GOALS OF LOW-RESOURCE AGRICULTURAL DEVELOPMENT

While the FSR/E approach is primarily oriented toward addressing the described needs of *any* relatively homogeneous group of farmers, FSR/E began with, and continues to place the greatest emphasis upon, those groups of small, limited-resource farmers and households. There should be no conflict between OTA's goals for this group and the FSR/E approach. There are, however, different potentials and limitations for the FSR/E approach in helping national agricultural research and extension systems play a lead role in individual goal achievement.

OTA GOALS:

1) "To Increase People's Quality of Life."

Potentials. FSR/E operates from the premise that increasing productivity by generating technology appropriate to the needs of farmers will contribute towards improving the general welfare of farmers and farm families. Because technology generated in the FSR/E approach involves farmers, their concerns regarding the potential impact of the technology on their quality of life can be incorporated into the design and testing of technology. In FSR/E, economic analysis to evaluate the potential of technology to increase income is included from the beginning of the process. Overall evaluation of technological solutions considers the whole system and its interactions with subsystems, and thus offers a better potential than conventional commodity research for generating technology that will enhance the quality of farmers life rather than just the productivity of a single crop.

Limitations. FSR/E cannot solve all problems associated with people's quality of life. It can contribute, but it is not a panacea. Linkages of FSR/E with other efforts to improve rural life must be made. FSR/E is not incompatible with general rural development, and must be viewed as a part of it, not a replacement. FSR/E has, within the past three years, greatly enhanced its capability to deal with household and gender issues. Efforts are being made to disaggregate data and to look more closely at *who* is doing the work, who has access to technology and who receives the benefits of better technology. This methodological improvement is not complete, and not practiced yet by the majority of practitioners. Training of practitioners in how to collect and use data on household dynamics and gender in the design, testing and evaluation of technology is needed. The training case studies developed by FSSP and the Population Council (Feldstein and Poats, 1985) will help improve this area. In particular, FSR/E needs this methodological improvement to better evaluate the potential of new technology to impact positively on one member of the household and negatively on the other.

FSR/E has not focused much attention on increasing rural employment, however, practitioners are beginning to measure productivity in terms of returns to labor and returns to capital, instead of just returns to land in order to assess what impacts new technology might have for situations of labor scarcity and labor excess. FSR/E has only begun to conceive of the linkages within diagnosis, design and evaluation of technology to consumption and nutrition issues. Frankenberger (1985) outlines how this can be improved, and practitioners are experimenting with procedures. Of greater necessity is the improvement of the general linkages between all agricultural development (FSR/E included) with efforts to improve rural health and nutrition.

2) "To Reduce Vulnerability."

Potentials. FSR/E can reduce the vulnerability farmers face when adopting new technologies or considering changes in their farming system because farmers are involved themselves in the process of developing the technology. Because technology is tested and evaluated on farms under farmer management and by farmers before it is recommended for dessimination, the potential vulnerability is considered in the development process and the technology can be altered in order to reduce vulnerability.

Limitations. There are no guarantees in reducing vulnerability. Other factors and changing ecological, social and political conditions can alter the potential of a technology to increase (or decrease) farmer vulnerability. Continued monitoring of new technology through its dissemination to other farmers will help to evaluate vulnerability. Problems identified, even as dissemination is underway can be addressed in subsequent stages of diagnosis and design. Better understanding of gender issues among practitioners will allow them to better evaluate vulnerability of women farmers in their ability and willingness to adopt new technology.

3) "To Maintain, Build Upon, and Improve Indigenous Resources and Systems."

Potentials. The holistic premise of FSR/E is its greatest potential for being able to achieve this goal. The interdisciplinarity of FSR/E and strong inclusion of social scientists in the technology-generating process means that questions and issues of maintenance and improvement of indigenous systems are more likely to be addressed than within strict commodity improvement schemes.

Limitations. FSR/E to date, has still largely been based in research entities focused on crop production. There has been little attention to and involvement of natural resource conservation and livestock or pastoral systems, thus questions involving the linkages to and impact at regional and macro levels has been limited. The French R-D (theme lourd) model does address these issues and increasing exchange of information between practitioners will hopefully improve this area. FSR/E practioners are increasingly addressing the livestock issues and focussing attention on the linkages between crop and animal production in the diagnosis of problems and the design of potential solutions. FSSP has sponsored several efforts to improve the methodology of on-farm experimentation with livestock and is collaborating closely with ILCA on this topic. Increased attention of FSR/E practitioners to technologies such as animal traction is also improving the understanding of relationships between crop production, crop residue use, labor involved in the care of traction animals, and the management of traction animals.

4) "To Ensure Economic and Environmental Sustainability."

Potentials. The potential of FSR/E to address this goal is the same as for the previous goal. This potential is enhanced through the linkage of FSR/E with efforts to look at the larger system (French R-D) or the development of new farming systems (NFSD).

Limitations. However, the issue of sustainability in the generation of new technology has not been a strong feature of FSR/E as practiced. Many FSR/E practitioners do not include the natural system in their analysis of the impact of new technology, assuming that the new technology impacts only on the portion of the natural environment which is already used for agricultural production. Perspectives, concepts and tools from agroforestry and natural resource conservation are being adopted by some practitioners. Further communication of these experiences and then training in the necessary skills will improve the ability of FSR/E to address this goal.

A second area of limitation lies within the diagnostic process itself. FSR/E "with a pre-determined focus" on specific crops has little likelihood of addressing larger questions of economic and environomental sustainability. More emphasis on FSR/E "in the small," especially in national programs, will improve the ability of FSR/E practitioners to ask questions addressing these issues.

Finally, many FSR/E practitioners have not fully engaged the farmer in the diagnosis of problems, and therefore indigeneous practices to ensure economic and environmental sustainability have not been explored. The fact that farmers themselves may have rational means of addressing these issues, and that researchers and extension workers can learn these for use in the improvement of the system as a whole is an area that needs far greater attention.

5) "To Improve the Quantity and Quality of Agricultural Production."

Potentials. This is the overall goal of FSR/E. Because FSR/E specifically addresses the problems of low-resource farmers, and such farmers in many countries, especially in Africa, comprise up to 90% of all farmers, FSR/E does have the potential to contribute substantially to the general improvement of the quantity and quality of agricultural production.

Limitations. The limitations of FSR/E in terms of this goal are the same as the limitations and needs for improvement listed under previous goals.

6) "To remove or reduce production, marketing, storage, and processing bottlenecks."

Potentials. FSR/E is currently applied primarily to the reduction or elimination of production bottlenecks, and most of the efforts reported to date deal with this aspect. However, some practitioners are successfully working with a "food systems" perspective (Rhoades and Potts, 1985) and using FSR/E methods to improve storage systems, food processing and marketing. Expansion of the perspective to include the food systems has great potential for addressing many of the activities that are often the responsibility of women (food processing, storage, marketing and preparation).

Limitations. More practitioners need to expand their view beyond food production *per se* and include accounting and review of technological adjustments for processing, storage, marketing and preparation of food. This expansion will benefit the incorporation of gender issues into FSR/E methodology, however caution will have to be taken not to assume that these areas are only the domain of women, nor that women are only involved in these activities.

APPENDIX 10

COUNTRY CASE STUDY: ICTA IN GUATEMALA

In the early 1970's, Guatemala recognized that its "conventional" research effort was simply not adequate and set out to completely remodel its effort. It received considerable support, both moral and financial, from the USAID Mission and the Rockefeller Foundation. The remodelling effort built heavily on the CIMMYT/Rockefeller experience in Puebla, Mexico. Planning extended over several years, and resulted in ICTA (Instituto de Ciencias y Tecnologia agricola), oriented heavily to increased production in the small farm sector.

ICTA de-emphasized the terminology and trappings normally associated with agricultural research. It had no central experiment station, and its regional stations were called "production centers." It initiated operations in three regions very different from each other—one in the heavily populated highlands, one on a land-reform area on the coast where farm size was 25 hectares, and the third in the semi-arid southeast area. Teams were placed in these regions and were known as "production teams," not research teams. Two of them were headed by expatriates, one from the United States and one from Chile. The third was headed by a national.

ICTA strategy recognized Guatemala's resource limitations and specifically set out to make full use of international technical resources.It did this for a few years by expatriate individuals, but ended up contracting from CIMMYT for maize and CIAT for bean expertise. It planned to develop its own capacity in economics and social sciences, although in the beginning it depended on expatriate expertise.

The ICTA experience in a way represented a grand experiment, in making its original concepts operational. However, it held firm to some key concepts developed in the developmental phase. One of these was, a sharp, forceful declaration of mission which was to increase the productivity, production, and well-being of the small scale farmer. Simply doing research, even good research, was not enough.

It set out to develop a doctrine among its personnel that reflected its mission. This doctrine, among other things, included (1) respect for the farmer as a rational, intelligent human being and (2) a concern for how well people were doing as farmers. None of the national personnel on the original production teams had more than a B.S. equivalent, while most of the expatriate personnel hold PhD's. and ICTA's national researchers had M.S. degrees. The doctrine also held that the production teams should be respected as intelligent, human beings.

The production centers were literally that. Changing the name was much more than cosmetic. Also part of the ICTA institutional doctrine was that an experiment station test of a new technology, including varieties, was not adequate. The final test had to be made on the farm by farmers. Most research was done on farms and eventually in collaboration with farmers. Guided by respect for farmers, ICTA personnel identified those who were interested in experimenting and who could make useful suggestions for experiments.

Commodity and subject matter researchers accustomed to the comforts, conveniences, and controls of experiment stations fretted under the scheme, but the concept of working with farmers was held so strongly by ICTA management, and supported by donors, that they moved to on-farm research by stages. At first, they wanted research controls equal to experiment station controls, and they wanted to control the research program, all according to the traditions they knew.

While ICTA management held firmly to some critical concepts, it also provided for considerable participation by its personnel in direction and policy. A series of meetings between commodity researchers and production teams led to a type of matrix management. Commodity teams were responsible for maintaining the integrity of the national commodity research programs. Production teams were responsible for the integrity of the geographic area research program. The meeting delt with reporting and analyzing last seasons research and planning next season research. The teams had to come to terms with each other.

In a relatively short time, the commodity teams found they could double or triple the number of field trials by collaborating with the production teams. They found they could also get qualitative evaluations and insights from the production teams who were working closely with farmers that conventional field data did not provide. As a result, breeders, for example could release varieties more quickly and with more confidence that they had been adequately tested than without the work of the production teams. Although known as a production progam, the ICTA program played a significant role in accelerating the CIAT program of breeding bean varieties resistant to the golden mosaic virus. These varieties have served other CIAT clients.

An evaluation of ICTA made by AID in 1980 indicated that annual returns to ICTA breeding programs was about 2.5 times the annual ICTA budget. Partly responsible for that return, however, was a seed processing program that ICTA developed. ICTA did not produce seed and did not deal in seed. However, it did provide cleaning and storage services and maintained a limited control over varietal purity.

ICTA demonstrated several important factors with respect to national agricultural research development. One was the importance of a clear cut and firmly held sense of mission that permeated the entire organization and was supported by doctrine of respect and concern for farmers and a confidence in technology innovation as a means to assist them. In terms of management and institutional development it demonstrated the potential of a national system feeding off of technology from the international network, and it demonstrated an effective integration of commodity and area specific research. ICTA experience has also made a very significant contribution to the state of the art in FSR/E methodology. ICTA never uses the terminology "FSR/E". Yet many of the accepted FSR/E methodologies were developed in the ICTA program.

Unfortunately, the management and institutional development skills ICTA developed have not been built into the state of the art. The ICTA experience demonstrated two serious inadequacies in the area of institutional development. Linkages between ICTA and the Extension Service were very slow to develop. The cause is not determined. In part, ICTA production teams were operating so close to the farmer that it was doing considerable extension itself and did not feel the pressure to develop linkages. In part, since much of ICTA technology was embodied in seed, the seed distribution system was a de facto extension service.

The second institutional inadequacy was that ICTA made almost no effort to explain itself to the government of Guatemala and develped little skill in (a) keeping itself financed and (b) protected from the ever present political forces that obey criteria completely independent of agricultural development.

APPENDIX 11

INCLUSION OF INTER- AND INTRAHOUSEHOLD ISSUES, GENDER ISSUES AND NON-FARM INCOME-GENERATING ACTIVITIES IN FSR/E

A number of FSR/E projects, including those based in Botswana, the Eastern Caribbean, parts of Indonesia, the Philippines, Burkina Faso, Kenya (ICRAF), Colombia (CIAT/IFDC) and Zambia, have incorporated various measures of inter- and intrahousehold production, labor distribution, and income systems into their framework and analyses for several years (FSSP/Population Council FSR/E Case Studies, forthcoming). Intrahousehold efforts in Lesotho have been going for seven years. The WIADP project in Malawi demonstrated the effectiveness of conducting on-farm experiments with women cooperators and training male extension agents to better work with women farmers (Spring, 1984). FSSP developed a roster of over 90 projects using a FSR/E or farming systems perspective that have incorporated to some extent intra-household production and income measures and gender analysis. Two-thirds of these have incorporated these into diagnostic efforts. A third have carried them through their design, experimentation or intervention activities. Many have developed innovative methods of data collection, analysis and monitoring on these issues. At a recent conference held at the University of Florida on "Gender Issues and FSR/E" over sixty papers were presented on the topic, from countries representing every world region (Poats, Schmink and Spring, forthcoming).

From review of the efforts listed above and others, one can conclude that there is general agreement on the two basic arguments underlying the need to include and analyse information on households and gender in FSR/E. First, is that the intra- and interhousehold relations are embedded in farming systems and will have an effect on and be affected by changes in these systems. Second is that FSR/E is an iterative and collaborative process, one which explicitly calls for continuous assessment and redesign. Because it is not linear, but overlapping and all activities occur simultaneously, there must be a continuous flow of knowledge, including, most importantly, the views of the farmers (men and women) whose system(s) will be affected (Feldstein, 1986).

The dilemma facing practitioners and research/extension managers is how to expand FSR/E approaches more systematically to include intra-household data collection and analysis and thereby address the arguments delineated above. The need for such data collection has existed from the very beginning of FSR/E and is now well-perceived in most quarters. However, action and implementation are often hampered due to a perception of high cost. High cost is most often associated with the belief that methods to collect such data and its analysis are expensive and time-consuming, and that only highly trained professional social scientists can handle these needs. Recent examples have shown that neither of these are necessarily true.

First of all, it is not necessary to have a social scientist on every FSR/E field team. In Zambia, locating a social scientist within the coordinating entity of the adaptive research program has facilitated the inclusion of social science methods by certain field teams in order to more fully explore household and gender issues in adaptive research. In other countries (Guatemala for example), agricultural technicians have been taught social science skills to enable them to collect and analyse household as well as other socioeconomic data. Their efforts are supported by a central department which provides further analysis and interpretation of results. Greater networking and exchange of information between projects such as these has resulted in better knowledge of appropriate methods. For example, as a result of the case studies project by the FSSP and Population Council a guidebook of methods which have proven effective in the field is being assembled and should assist other practitioners who are requesting help in dealing with this area (Feldstein and Jiggins, forthcoming).

High cost or insufficient budget is still often given as the reason not to include better household understanding and analysis in FSR/E approaches. A short run view may lead administrators and managers to see the professional salary of a social scientist as too high when taken out of context. But when placed in the context of the potential for new technology to be acceptable or not, the potential benefit of social science incorporation in general, and the household realm in particular, far exceeds the cost.

During the early years of FSR/E, it was extremely difficult to obtain the services of a trained applied anthropologist or rural sociologist to work with an FSR/E project or approach. Few of these social scientists, though interested in this aspect of the rural population, had adequate training in agricultural sciences to enable them to work effectively with teams composed largely of agricultural scientists. Few of the national agricultural research and extension systems saw the need to create mainline positions for non-agriculturists and often host country governments were wary of social scientists working with the poorer peoples in their countries. Perhaps more importantly, there were very few international centers or other agricultural research and development organizations that had already made this move to serve as role models. Fortunately, this situation has changed greatly, and it is almost commonplace for interdisciplinary teams to include a social scientists, very often, an anthropologist. Good guidelines are being written to assist projects in incorporating these and other dimmensions into projects (Rogers, 1985). The IARCs, especially those that "broke new ground" in incorporating anthropologists within their programs (Rhoades, 1985), are now changing their previous positions and considering the difference that gender-sensitive agricultural technology development might make to their work (Jiggins, 1985). Likewise, the IARC's are beginning to realize that productivity can be improved by looking outside of farming techniques per se, and that FSR/E has the capacity to facilitate this view. This could extend to non-farm income generating activities.

> A crop becomes a food only after it is cleaned, prepared and in most cases, cooked. The returns to improvement in these activities, commonly performed by women, might often exceed returns from efforts directed to improving crop yields. In addition, research on minor crops and small animals could also yield important benefits (Plucknett _et_ _al_., 1986).

A general broadening of the disciplinary perspectives that can be brought to bear upon the use of FSR/E has also created the need for the development, dissemination and training in the use of, simplified social science methodologies for field FSR/E teams sensitized to working with resource-limited farmers, but with little or no specialized knowledge of how to go about doing it. A similar situation exists in the growing realization that consumption and nutrition linkages need to be considered in the use of a FSR/E approach, and there is growing interest in developing simplified nutritional tools which can also be used by field teams without exceptional nutritional expertise. (Cohen, 1986; Frankenberger, 1985). Unfortunately once again, these necessities, even when demonstratably simplified and cost-efficient, appear to be costly additions to FSR/E in the eyes of administrators and donors in terms of both scarce funds and human resources. The growing realization of these needs also coincides with a time when bilateral donors face budgetary crises of their own, and are less likely to fund FSR/E projects at a level necessary to allow for the more efficient gathering of such necessary data (USAID, 1985b).

What is needed today and in the future is greater stress upon coordinated innovation. This should take the form of host country governments coordinating any bilateral project of any donor so as to take the utmost advantage of secondary financial and human resources. Such secondary resources as the U.S. Peace Corps and its equivalent among other bilateral donors, both expatriate and host country graduate students in the disciplines of social science, agriculture and agroforestry, and various PVOs will evolve into primary sources of support contributing more directly to the advance of agricultural development throughout the third world. While the approach which unites these groups together with bilateral donors through the mediation of host country governments may be FSR/E in the beginning, the force which will unite them all in the longer run will be the overriding necessity for sustained agricultural progress and the complexities of the problems which still must be resolved to avoid wide-spread famines.

APPENDIX 12

SPECIFIC CRITERIA PROJECT LOG FRAME AND INTERNAL SELF-EVALUATION

* Project should be linked to the successful negotiation of FSR stages by the contractor team and host country counterparts: By year y, x diagnostic surveys will have been completed. By year (y+1), z on-farm trials will have been conducted (at this point, the log frame may distinguish between RIRM, RIFM and FIFM trials). By year (y+n) (where n is the final year of the project), two to three appropriate technologies will be available for extension to a broader region than the project pilot area.

* X (number of) students in the appropriate disciplines of a, b, c, ... n, have been trained, using project funds, over y years since the project began. By year (y+n), x (number of) trainees will return and 1) replace expatriate technical advisors and/or 2) be reintegrated into the research (or extension) systems of the host country.

* Since the beginning of the project at the farm level in area z, 1) the proportion of researcher-implemented, researcher-managed (RIRM) trials has decreased from a% to b%; 2) the proportion of researcher-implemented, farmer-managed (RIFM) trials has changed from c% to d%; and 3) the proportion of farmer-implemented, farmer-managed (FIFM) trials has increased from e% to f%.

* By year y, x technical innovations will be used by extension in area z.

* Since the project began, the proportion of trials conducted by researchers on-farm has increased from x% to y%.

APPENDIX 13

CASE STUDY: INDONESIA TROPSOILS PROJECT

The Tropsoils Project was conducted in Sitiung, Indonesia as a Collaborative Research Support Project (CRSP) by scientists from the Indonesian Government's Agency for Agricultural Research and Development, the United States Agency for International Development, the University of Hawaii, and North Carolina State University. A major research problem has been matching soil management technology to the people who will use it. The principle goal of the Tropsoils Project is "to uncover principles which will enable resource poor farmers to adopt soil management practices that will increase family income and farm productivity and at the same time preserve land quality (McCants, 1985). An FSR/E approach was adopted by the Tropsoils Project to help reach project goals. Soil management practices were analyzed and new technologies developed within the perspective of the whole farming system. FSR/E considers farmers, components such as soils, and commodities such as food crops, tree crops, and livestock, to be parts of an integrated system in which human, agricultural, and ecological factors are balanced.

Consideration of the "human" factor of gender led the Sitiung Project to conduct research on home gardens that demonstrated the gardens' economic and nutritional significance within the farming system and the important roles women played in production. Research comparing transmigrant farming systems with indigenous farming systems resulted in the discovery that different ethnic groups used very different soil management practices. Based on these findings, the Sitiung Project went on to do research on different tillage practices and on tree crops.

The FSR/E approach emphasizes active collaboration with farmers to develop technology. The Sitiung team learned the farmers' views on soil management practices and used them in developing research designs. These designs were then submitted to the farmers for their consideration and revised to be consistent with the goals of both farmers and researchers. Implementation of these joint plans was made easier because of the atmosphere of mutual respect engendered by this collaborative approach.

Since FSR/E emphasizes a systems approach, the Tropsoils Project investigated other spheres of human activity in addition to farming practices, that appeared to affect soil management. These investigations identified several constraints that might affect farmers' adoption of proposed soil management practices. These constraints included: 1) economics — farmers could not afford to buy the recommended 6 tons of lime/ha to fertilizer their fields; 2) culture — farmers resisted planting cowpeas, an aluminum tolerant crop, because few people ate them and prices were low; 3) time and labor demands on household members — the proposed introduction of pasture grasses and legumes might be well received since it could alleviate the considerable amount of time and labor spent in gathering fodder for stall fed cattle and goats.

The inclusion of research on areas other than soil management practices provided useful information for team members. An economic survey yielded data on the amount of cash farmers had available for the purchase of inputs recommended by the agricultural scientists. Concern over the project's impact on community nutrition led to a study of nutritional status in Sitiung that provides baseline data for future comparisons as well as to research on vegetable crops to enhance nutrition. The findings of time allocation research can be used to assess the costs and benefits of implementing the proposed soil management technology to household members. Finally, an investigation of indigenous perceptions of the soil produced information useful to research and extension activities including the differentiations farmers made between soil types, their methods of choosing good land, and their strategies of altering soil management practices by land type.

These examples demonstrate how the systems approach basic to FSR/E yields data useful to the design of better technology in a soil management project and to a higher likelihood of its successful adoption by the target population.

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APPENDIX 14

CASE STUDY: PANAMA

A Review by Peter Hildebrand

"Institutional Innovations in National Agricultural Research: On–Farm Research within IDIAP, Panama"

by Juan Carlos Martinez and Jose Roman Arau

This extremely valuable publication is one of the first to document the history of a farming systems project from planning through adoption. In particular, it is valuable because it also includes a section on cost efficiency. This latter item has been debated by many donors, yet it is difficult to verify because of the nature of the information gathered in the usual course of a farming systems project.

Both an informal survey and a formal survey were used to gather preliminary data from the Caisan area of western Panama. The Caisan area covers 10,000 hectares and has some 300 farmers. Two recommendation domains initially were defined and one of the two was chosen for concentrated efforts because of the limited resources available to the program staff. Partially because of the CIMMYT mandate, emphasis was given to maize production in the farming system of the area. The technological components incorporated in the first round of trials were weed control, spatial arrangement and density, fertilizer requirements (nitrogen and phosphorus), and lodging. The last component was handled separately from the others in a special maize improvement program to reduce plant height.

The first exploratory trials utilized an incompletely randomized block design with a factoral arrangement of 2^4 and without replications. Results showed a marked yield advantage for herbicide (H), and planting distribution-density (D) practices but little nitrogen or phosphorus effect. The HxD interaction was significant at the 10 percent level. Economic analysis indicated a high (700 percent) marginal rate of return for the combined H and D alternative, so they were considered together for the second round of trials.

Following the first round of trials, (as well as the second and third rounds), the results were integrated with the results of the surveys. "The data were reviewed, new hypotheses formulated, and new lines of research charted, both for the on-farm research program and for experiment station research. Where appropriate, recommendations for farmers were made as well as those for agricultural policy." This procedure is a critical component of the FSR/E methodology.

In the second research cycle, a zero tillage system was incorporated as an alternative to conventional tillage as a cost saving rather than a yield increasing technology. The zero tillage system was also seen as a means of reducing erosion, a problem identified both by the researchers and the farmers.

During the third cycle, three verification trials were conducted in the area. Though this is a very small number, the results tended to verify the earlier results that zero tillage, chemical weed control with Gesaprim 80, no fertilization and 50,000 plants per hectare planted in rows was the superior technology to use.

"The Caisan research program was guided by the principle that the best guarantee for the adoption of recommended technologies was to assure that farmer circumstances were taken into account from the outset, leading to recommendations which were appropriate to those circumstances."

"The technology transfer process followed in the project involved farmer field days at experiment and demonstration sites to discuss the alternative technologies involved. With these elements, and the degree of communication which existed between farmers in the area, their response exceeded initial expectations. Furthermore, farmers themselves played an active role in the process of technology generation. For example, cooperating farmers modified the Gramoxone container so that it could be used as an applicator in the field. Similar farmer-originated adaptations occurred in zero tillage. Some farmers (particularly larger landholders) found it difficult to find the labor required by the manual chopping of old stands, the initial step of the zero tillage alternative. In consultation with the research team, they used a light harrowing pass instead of hand chopping to cut back the weeds and crop residues, thus arriving at a minimum tillage system."

"Following only three cycles of research activity, the Caisan project was evaluated by IDIAP. The evaluation included an adoption survey related to the technologies generated by the project. Sixty to 80 percent of the farmers representing like amounts of the maize area had adopted the seed control and planting recommendations and used no fertilizer. Over 40 percent of the farmers with 23 percent of the maize area had adopted zero or minimum tillage. "The high rate of adoption of recommended practices among Caisan farmers, particularly considering that the research project had only been in operation for four years (three cycles), stands as testimony to the validity of the research methodology which led in such a short time to the development of appropriate technology for target farmers — the final judges of the usefulness of production-oriented research."

In fewer than four years, the social rate of return was much greater than the amount invested by IDIAP. Even assuming no further adoption after 1982, the rate of return was 188 percen according to the IDIAP evaluation.

Area-specific, on-farm research activities have gone through considerable expansion in Panama since 1978 when the Caisan program was begun with only two national researchers. At present they include five priority areas in crops, involving 24 national researchers and three priority areas in livestock with 21 researchers. ■

"Institutional innovations in national agricultural research: On-farm research within IDIAP, Panama" by Juan Carlos Martinez and Jose Roman Arauz
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APPENDIX 15

BRIEF SUPPLEMENTAL CASE STUDIES FROM AFRICA

Malawi

Malawi has a national adaptive research program from which adaptive research teams operate in several Agricultural Development Districts (ADDs). Coordination is provided by a national coordinating unit based at the Chitedze research station (Nyirenda, 1985).

Zimbabwe

In Zimbabwe, the Directorate of the National Department for Research and Specialist Services formed one FSR unit to conduct research on both crop and livestock production, following individual FSR projects on crops and livestock funded by separate donors. In 1984, FSR became an autonomous unit with a core team in Harare guiding and supporting two small regional teams (Chiduza and Rukuni, 1985).

Rwanda

Rwanda also has an FSR department within its national agricultural research institute, ISAR. However, it does not as yet play any effective coordinating role among the various other regional FSR or commodity OFR activities.

Lesotho

In 1979, Lesotho, with support from USAID, created an FSR unit within the Agricultural Research Division of the Ministry of Agriculture. Following an external evaluation in 1981, the idea of a separate unit was abolished in favor of a more generalized strengthening of the entire research division's capacity to conduct research on smallholder agricultural production con-

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straints, as well as its ability to transfer relevant technologies to farming communities (USAID, 1983a). All research in Lesotho is mandated as systems-oriented, and three prototype pilot areas representative of distinct agro-ecological zones have been established for on-farm testing. Though largely focused on research, considerable linkage, coordination, and involvement of extension has been achieved.

Kenya

Kenya has taken a similar position to Lesotho on FSR/E and, in 1984, FSR teams were estalished at 10 research stations. These teams work with extension staff from adjacent districts. The Kenyan approach is currently enhancing the FSR/E capacity within teams through short-term training courses sponsored by CIMMYT.

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ACRONYMS USED

ABSs	Annual Budget Submissions (of USAID)
ADDs	Agricultural Development Districts (Malawi)
ADRAO	Association pour le Developpement de la Riziculture en Afrique de l'Ouest
AFNS	Agriculture, Food and Nutrition Sciences Division (IDRC)
AFSN	Asian Farming Systems Network
AID	(or USAID) The United States Agency for International Development
ARP	Agricultural Research and Production Project (Nepal)
ARPT	Adaptive Research Planning Team (Zambia)
ATIP	Appropriate Technology Improvement Project (Botswana)
AVRDC	Asian Vegetable Research Development Center
BAME	Bureau de l'Analyse Macro-economique (of ISRA, Senegal)
B/C	Benefit-cost ratio
CARDI	Caribbean Agricultural Research and Development Institute
CATIE	Tropical Agricultural Research and Training Center (Turrialba, Costa Rica)
CDSS	Country Development Strategy Statement (of USAID)
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture (Cali, Columbia)
CICCs	Crop Improvement Coordinating Committees
CIMMYT	International Maize and Wheat Improvement Center (El Batan, Mexico)
CIP	International Potato Center (Lima, Peru)
CIRAD	Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement (Montpellier, France)
CMDT	Compagnie Malienne pour le Developpement des Textiles (Mali)
CRSPs	Collaborative Research Support Programs
DNA	Deoxyribonucleic acid

DOA	Department of Agriculture (or Division of Agriculture)
DRSPR	Division des Recherches sur les Systemes de Production Rurales (of IER, Mali)
DSA	Departement Systemes Agraires (CIRAD)
ESA	East and Southern Africa
FAC	Fonds d'Aide et de Cooperation (France)
FAO	Food and Agriculture Organization (of the UN)
FBF	Farmer-back-to-farmer
FIFM	Farmer-implemented, farmer-managed trials (see also RIFM and RIRM)
FSA	Farming Systems Analysis
FSAR	Farming Systems Approach to Research
FSBDA	Farming Systems Base Data Analysis
FSDP-EV	Farming Systems Development Project-Eastern Visayas (Philippines)
FSP	Farming Systems Perspective
FSR	Farming Systems Research
FSRAD	Farming Systems Research and Development
FSR/E	Farming Systems Research and Extension
FSSP	Farming Systems Support Project (Gainesville, Florida)
GARD	Gambia Agricultural Research and Development Project (Gambia)
GRET	Groupe de Recherche et d'Echanges Technologiques (France)
GTZ	Research Centre for International Agrarian Development (W. Germany)
HARP	Honduran Agricultural Research Project (Honduras)
IAM	Institut Agronomique Mediterraneen (Montpellier, France)
IARCs	International Agricultural Research Centers
IBPGR	International Board for Plant Genetic Research (Rome, Italy)
IBRAZ	Institut Burkinabe de Recherche Agronomiques et Zootechniques (Burkina Faso)
ICARDA	International Center for Agricultural Research in the Dry

	Areas (Aleppo, Syria)
ICIMOD	International Centre for Integrated Mountain Development (Kathmandu, Nepal)
ICRAF	International Council for Research in Agroforestry (Nairobi, Kenya)
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics (Hyderabad, India)
ICTA	Institute of Agricultural Science and Technology (Guatemala)
IDESSA	Institut des Savannes (Ivory Coast)
IDRC	International Development Research Centre (Canada)
IER	Institut de l'Economie Rural (Mali)
IFAS	Institute of Food and Agricultural Sciences (University of Florida)
IFPRI	International Food Policy Research Institute (Washington, DC)
IICA	Inter-American Institute for Cooperation on Agriculture
IITA	International Institute for Tropical Agriculture (Ibadan, Nigeria)
ILCA	International Livestock Center for Africa (Addis Ababa, Ethiopia)
INA	Institut National d'Agronomie (Paris, France)
INRA-SAD	Agrarian Systems Department of the National Institute of Agronomic Research (France)
IPM	Integrated Pest Management
IRAZ	Institut de Recherche Agronomique et Zootechnique (Burundi based institute serving Great Lakes region of Zaire, Rwanda and Burundi)
IRRI	International Rice Research Institute (Los Banos, Philippines)
ISNAR	International Service for National Agricultural Research (The Hague, The Netherlands)
ISRA	Senegalese Agricultural Research Institute
MFP	Mixed Farming Project (Gambia)
MOA	Ministry of Agriculture
NARP	National Agricultural Research Program

NARS	National Agricultural Research Service
NARES	National Agricultural Research and Extension Systems
NCRP	Nationally Coordinated Research Project(s) (Nigeria)
NERAD	North Eastern Research and Development Project (Thailand)
NFSD	New Farming Systems Development
NGOs	Non-governmental Organizations
OAU	Organization of African Unity
OFR	On-farm Research
OFR/FSP	On-farm Research with a Farming Systems Perspective
OFS	On-Farm Studies
OTA	Office of Technology Assessment (of the US Congress)
PCCMCA	Central American Cooperative Program for the Improvement of Food Crops
PID	Project Identification Document
PP	Project Paper
PRONAM	Programme Nationale Manioc (Zaire)
PVOs	Private Voluntary Organizations
R&D	Research and Development
R-D	Recherche-Developpement
RARCs	Regional Agricultural Research Centers
RDO/ADO	Rural Development Officer/Agricultural Development Officer (USAID)
RDNA	Recombinant Deoxyribonucleic acid
RFS	Research on Farming Systems
RIFM	Researcher-implemented, farmer-managed trials (see also FIFM and RIRM)
RIRM	Researcher-implemented, researcher-managed trials (see also FIFM and RIFM)
RPFs	Resource-poor farmers
RRFs	Resource-rich farmers

RSP	Recherches sur les Systemes de Production
RSS	Research Station Studies
SAFGRAD	Semi Arid Food Grain Research and Development (Headquarters: Burkina Faso)
SCBR	Systems Component Basic Research
STRC	Scientific Technical and Research Comission (of the OAU)
SUAN	Southeast Asian Universities Agroecosystem Network
TAC	Technical Advisory Committee (of the CGIAR)
TARO	Tanzania Agricultural Research Organization
TIP	Technology Innovation Process
T&V	Training and Visit
UE	Experimental Units (Senegal)
UPLB	University of the Philippines at Los Banos
USAID	(or AID) The United States Agency for International Development
WAFSRN	West African Farming Systems Research Network
WARDA	West African Rice Development Association (Monrovia, Liberia)